

DOCUMENT RESUME

ED 163 681

EC 112 506

AUTHOR Stolovich, Harold D.
TITLE Reaching the Handicapped Through Their Teachers: The Development and Evaluation of Two Competency-Based Training Modules. Parents as Partners in Teaching Handicapped Children. Final Report 9.33.
INSTITUTION Indiana Univ., Bloomington. Center for Innovation in Teaching the Handicapped.
SPONS AGENCY Bureau of Education for the Handicapped (DHEW/OE), Washington, D.C.
PUB DATE May 76
GRANT OEG-9-242178-4149-032
NOTE 189p.; Figures may be marginally legible
AVAILABLE FROM Indiana University, Center for Innovation in Teaching the Handicapped, School of Education, Bloomington, Indiana 47401 (\$,.50)
EDRS PRICE MF-\$0.83 HC-\$10.03 Plus Postage.
DESCRIPTORS *Audiovisual Programs; *Curriculum Evaluation; *Handicapped Children; *Instructional Materials; *Learning Modules; Literature Reviews; *Performance Based Teacher Education; Special Education Teachers; *Teaching Methods

ABSTRACT

A generalized instructional development model was constructed which could be adapted and applied to the production of competency based nonprint self-instructional materials for special education teachers, and which produced demonstrable learning. After reviewing the literature in the field, it was ascertained that a combination of audiocassette, print, and filmstrips would provide the maximum number of attributes at the minimum cost and time requirements. Two modules were then produced (by separate researchers) in order to test the development model. The modules were tested on 90 Ss (aged 19-55 years) who were randomly divided into groups. Among conclusions of the study were that the model constructed can be applied to the production of self-instructional audiovisual training modules, and, while the modules do have an immediate effect on competency acquisition, the competencies are not maintained over time. (PHR)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

ED163681

REACHING THE HANDICAPPED THROUGH THEIR TEACHERS:
THE DEVELOPMENT AND EVALUATION OF TWO COMPETENCY-BASED TRAINING MODULES
PARENTS AS PARTNERS IN TEACHING HANDICAPPED CHILDREN
INSTRUCTIONAL GAMES FOR HANDICAPPED CHILDREN¹

Harold D. Stolovitch

May, 1976

Final Report 9.33

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

Center for Innovation in Teaching the Handicapped
Indiana University

¹This research was supported by grant #OEG 9-242178-4149-032 from the U. S. Office of Education, Bureau of Education for the Handicapped from the Center for Innovation in Teaching the Handicapped. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

EC112586

Contents

	Page
List of Tables	iv
List of Figures.	vi
CHAPTERS	
I. STATEMENT OF THE PROBLEM.	1
Increasing Demand for Systematically Developed Instructional Materials Increasing Availability of Instructional Development Models Summary	
II. REVIEW OF LITERATURE.	5
Instructional Development Models Description of Instructional Development Models A Comparison of Instructional Development Models Media-Selection Strategies An Alternative Approach to Media Selection Adapting the 4-D Model Summary	
III. HYPOTHESES.	61
Summary	
IV. APPLYING THE MODEL TO THE PRODUCTION OF MODULES	66
Adapting the 4-D Model Analysis Stage Design Stage Evaluation and Diffusion Stages Production of an Audiovisual Training Module on Parent Tutoring Design Stage Media Allocation Response Book Script	

Visual Storyboard	
Expert Appraisal	
Revision	
Production of Prototype	
Assembly	
Developmental Testing	
Revision	
Final Production	
Production of an Audiovisual Training Module on	
Instructional Games for the Handicapped	
Needs Analysis	
Other Steps in Analysis and Design of the	
Module	
Summary	

V. EVALUATION OF THE MODULES 93

Evaluation Procedure	
Measuring Instruments	
Summative Evaluation of the Modules	
Subjects	
Scoring	
Summary	

VI. RESULTS AND DISCUSSION 103

Discussion	
Summary	

VII. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 128

Results	
Conclusions	
Recommendations	

REFERENCES 135

APPENDIXES 142

List of Tables

	Page
1. A Comparison of Instructional Development Systems Models . . .	36
2. Relationships of Instructional Media Stimuli to Learning Objectives	39
3. Equipment/Media Relationships and Considerations	40
4. Media and Their Attributes	49
5. Guide for Media Selection Process	50
6. Media/Media Attributes	56
7. Developmental Testing Stages	86
8. Frequency of Subjects in Terms of Age, Teaching Experience with Handicapped Children, Level of Education, and Number of Special Education Quarter Courses Taken	100
9. Means and Standard Deviations of Scores on the Criterion-Referenced Test on Parent-Tutoring	106
10. Two-Factor Repeated-Measures Analysis of Variance of Scores on the Criterion-Referenced Test on Parent Tutoring	107
11. Means and Standard Deviations of Scores on the Criterion-Referenced Test on Instructional Games	108
12. Two-Factor Repeated-Measures Analysis of Variance of Scores on the Criterion-Referenced Test on Instructional Games	109
13. Means and Standard Deviations of Attitude Scores Toward Parent Tutoring	113
14. Two-Factor Repeated-Measures Analysis of Variance of Attitude Scores Toward Parent Tutoring	114
15. Means and Standard Deviations of Attitude Scores Toward Instructional Games	115
16. Two-Factor Repeated-Measures Analysis of Variance of Attitude Scores Toward Instructional Games	116

17.	Means and Standard Deviations of Scores on Semantic Differential Attitude Towards Self-Instructional Materials	118
18.	One-Factor Repeated-Measures Analysis of Variance of Scores on Semantic Differential on Attitude Toward Self-Instructional Materials	119

List of Figures

	Page
1. Safe Model	8
2. Michigan State Model	10
3. Project Minerva Model	12
4. Teaching Research Model	14
5. Faris-Stowe Model	17
6. Banathy Model	19
7. IDI Model	21
8. Briggs Design of Instruction Model	23
9. Kaufman Model	26
10. Great Plains National Procedures for Instructional Design . .	28
11. Wong/Raulerson Model	31
12. 4-D Model	33
13. Independent Study for Independent Students	42
14. Summary Flowchart for Media Selection	43
15. Goodman's "Systematic Selection Model"	45
16. A Typical Model for Media Selection	47
17. A Better Model for Media Selection	48
18. Media/Media Qualities Chart	52
19. Completed Media/Media Qualities Chart	53
20. A Normal Media Selection Model	54
21. A Conventional Media Selection Strategy	57
22. 4-D Model	67
23. Adapted 4-D Model	68

24. Experimental Design	94
25. Summary of Treatment and Testing Procedures	104
26. Mean Performance of Groups on the Criterion-Referenced Test on Parent Tutoring	120
27. Mean Performance of Groups on the Criterion-Referenced Test on Instructional Games	121
28. Mean Attitude Scores of Groups Toward Parent Tutoring	124
29. Mean Attitude Scores of Groups Toward Instructional Games . .	125
30. Mean Responses of Subjects to Items on the Semantic Differential on Attitude Toward Self-Instructional Materials	126

INTRODUCTION TO THE REPORT

There is currently an enormous demand for systematically developed and evaluated instructional materials for teachers of the handicapped. Many models for instructional development are offered as a means to meet this demand. However, these models are too general to be of practical value for special educators. This study attempts to adjust an instructional development model to meet the special requirements of a specific media combination within the field of inservice and pre-service teacher training. The major purpose of this study is to derive a useable procedural model for the design, development, and evaluation of modules in both the Tips for Teachers Preinstructional and Instructional Series.

Increasing Demand for Systematically Developed Instructional Materials

The field of teacher training in the area of the handicapped is not alone in its need for competency-based materials to prepare teachers for dealing with the special needs of their learners. There is a growing emphasis on competency-based educational programs (Davies, 1973; Holcomb & Garner, 1973; Roush & Holcomb, 1974) and performance-based teacher education (Elam, 1971; Houston & Howsam, 1972; Rosentein, 1969; and Rosner, 1972). This has created a demand for systematically developed instructional modules and materials in both special and regular education. A similar demand has been created by the growing emphasis on individualized instructional systems. The successful implementation of such systems as Individually Prescribed Instruction (IPI), Individually Guided Instruction (IGE), and Program of Learning According to Needs (PLAN) has directly and indirectly initiated a need for instructional modules.

This increase in demand for instructional materials for regular teachers and for teachers of the handicapped is accompanied by pressure to evaluate these materials. Organizations such as the Center for Programmed Instruction and its successor, the Educational Products Information Exchange (EPIE), have played a leading role in both creating and satisfying this demand for evaluation. Learner verification and revision (LVR) programs are currently being sponsored by state and local educational agencies, the National Institute for Education (NIE), the National Science Foundation (NSF), and the U.S. Office of Education (USOE) (Tiemann, 1975). The accountability movement has raised many evaluative questions, not only about teachers and administrators, but also about the instructional materials they use (Alkin, 1972). New pieces of legislation dealing with the evaluation of instructional materials are being passed in some states. For example, Florida Senate Bill 492, Section 283.25 states that:

Publishers shall provide written proof of the use of the learner verification and revision process during prepublication development and postpublication revision of the materials in question. For purpose of this section learner verification is defined as the empirical process of data gathering and analysis by which a publisher of a curriculum material has improved the instructional effectiveness of that product before it reaches the market and then continues to gather data from learners in order to improve the quality and reliability of that material during its full market life.

timal media or media combinations. Many educational technologists advocate the production of instructional materials using nonprint media such as audiotape (Hodgon & Bullen, 1957; Postlethwait, Novak and Murray, 1972; Russell, 1974), slides and filmstrips (Brown, Lewis & Harclerod, 1973; Colthorp, 1958; Kemp, 1968), films (Hohan, 1971; Spottiswood, 1957; VanderMeer, 1941), television (Gordon, 1970; Littell, 1973; Mattingly & Smith, 1973; Mitchell, 1974) and computer-assisted instruction (Meredith, 1971; Semmel, Olson & Weiske, 1972). A number of experimental studies have demonstrated the effectiveness of these approaches (Moldstad, 1964; Moldstad, 1974).

As instructional development models presently exist, emphasis has been placed on their generalizability to a wide range of media, with the implication that the producer should tailor the model to the needs of the specific medium he is working with. "Design prototype material" is a standard step in many instructional development models, but it is seldom followed by any practical guidelines.

The problem which this study investigated was: Can a generalized instructional development model be adapted for the production of nonprint instructional materials for special educators?

Subsumed under this question is another: Does the nonprint instructional material produced through the application of the adapted instructional development model result in demonstrable learning?

To answer these questions, a suitable instructional development model was identified and adapted to fit the special needs of a specific media combination within the field of inservice and preservice teacher training. The instructional materials developed on the basis of this adapted model were tested with a sample of the target population to evaluate their effectiveness.

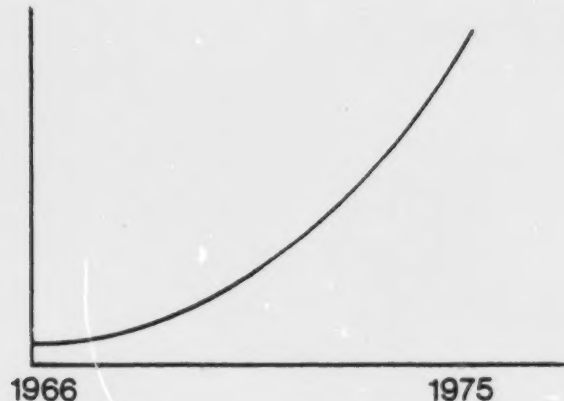
Chapter II

REVIEW OF LITERATURE

This chapter selectively reviews various instructional development models in order to identify an appropriate one. Next, a review of media selection strategies is undertaken to contrast some current approaches to the traditional strategies. An optimal media combination is identified on the basis of this survey. Finally, the instructional development model is suitably adapted to meet the requirements of the selected medium/media mix.

Instructional Development Models

A graphic representation of what has occurred in the area of instructional development model building over the last decade would probably look somewhat like this:



In the early 1960's technology began to make a major impact on the educational world. With its relationship to machines, educational technology took account of the "systems" approaches being increasingly employed by military and business and attempted to apply these techniques

to instruction. A branch of educational technology which dealt with instructional development used the design and application of instructional systems to a large extent. Twelker, Urbach and Buck (1972) define an instructional system as "any set of educational materials or strategies which has been developed through the use of a systems approach." In more specific terms, an instructional system is the product of a method for developing instruction through a rational process involving a clear definition of a problem, the development of a solution based on clearly stated objectives, the evaluation of the solution in terms of the objectives, provisions for feedback on the adequacy of the solution and appropriate revision of the solution.

From this basic "systems" approach has sprung a plethora of models for accomplishing the task of developing suitable instructional plans, courses and materials. Models have emerged from virtually all disciplines to encompass a broad range of interests and skills (e.g., administration, vocational training, television programming, psychology, philosophy). These models also run the gamut from simple "how-to" types (e.g., Wong and Raulerson, 1974) to complex prescriptions (e.g., Briggs, 1970).

The following review of instructional development models is undertaken with these purposes:

1. To examine a number of "systems" models which have become well known in the field in order to assess the unique contributions of each to instructional development;
2. Based on this review, to compare and contrast these models; and

3. To identify an instructional development model which is comprehensive, and applicable to the production and evaluation of instructional modules with nonprint components.

Description of Instructional Development Models

In this section, twelve instructional development models are described using a summary format. Each is identified by its name, developer and date. A brief description of the model is given along with a discussion of its strengths and weaknesses. Each model is also summarized in graphic form.

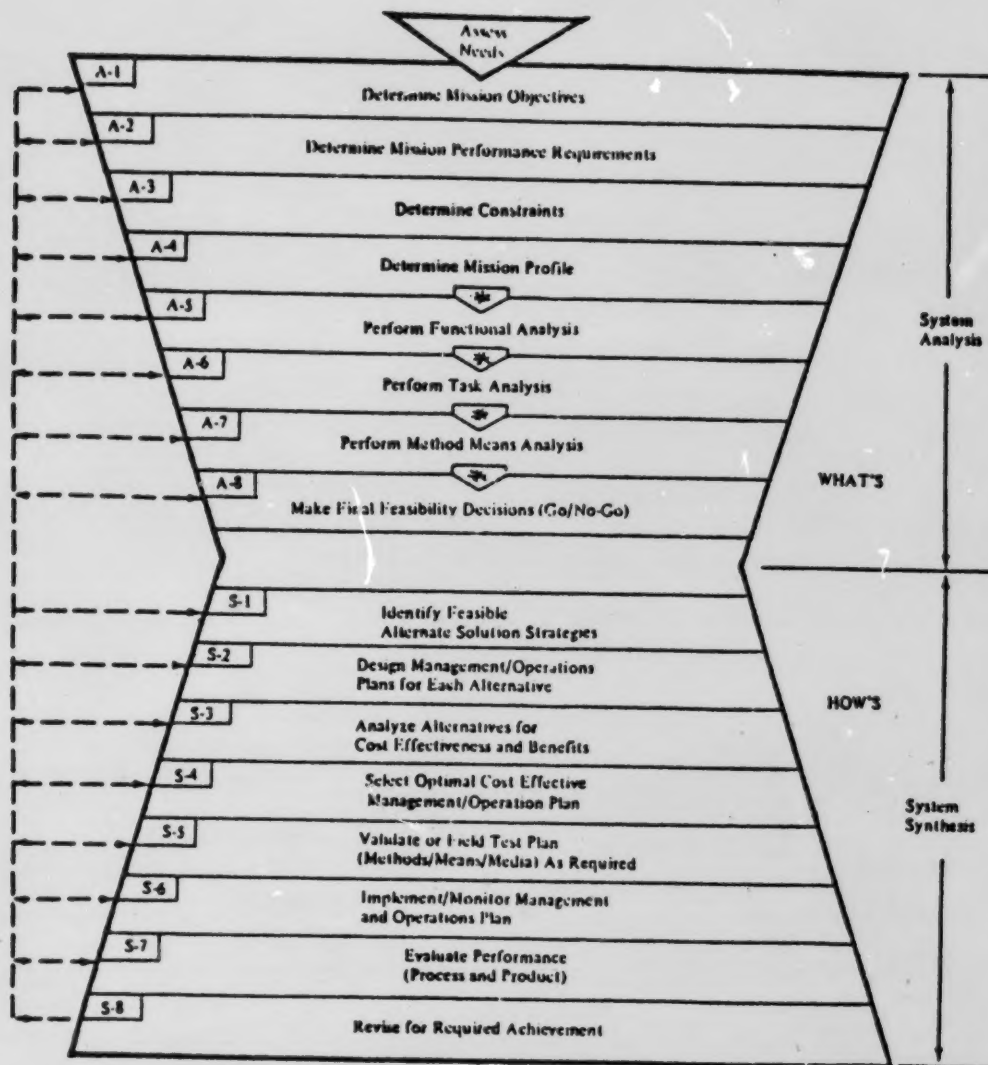
Name of Model: System Approach For Education (SAFE)

Developer: Robert E. Corrigan

Date: 1966

Description of Model: This model was originally designed as a problem-solving device for educators. It is divided into two major stages: a system analysis (a "what's") stage and a system synthesis (a "how's") stage. A needs assessment is first instituted followed by an analysis of mission objectives, requirements, constraints, tasks, and means. In the synthesis stage, alternative strategies are determined, constraints established, and the plan validated, implemented, evaluated, and finally revised. SAFE has been applied at a number of levels of education from public school to the graduate level. Several state departments and educational research laboratories, including the Northwest Regional Education Laboratory, have employed this model.

Strengths and Weaknesses: The division of developmental activities into



*Determine Requirement and Constraints

Figure 1
Safe Model

analysis and synthesis stages provides detailed steps for the analysis of problems which are often less well specified in other models. This emphasis on the problem-solving approach makes the model unique. In actual application, SAFE has been used with success. However, the distinction between the "What's" and "How's" stage does provide a false impression of complete division between analysis and synthesis. The major weakness of the model is its linear structure which causes problem-solving to be conceived of as a straight-line process. It is also sparse in the details of the production activity.

Name of Model: Michigan State University Instructional Systems Development

Developer: John Barson

Date: 1967

Description of Model: Derived through extensive trial and revision over a two-year period at four post-secondary institutions, this model has been developed for college faculty to use in designing courses. Sixteen steps are prescribed for instructional development. These steps include a statement of broad goals, collection and analyses of input data, development of pretest-posttest criteria, design, evaluation and recycling. At each step, the persons involved in the particular task and a brief statement of what is done are specified.

From 1965 to 1967, the steps were continuously refined into their final form. This model has subsequently been employed by Michigan State University to develop Special Learning Audio-Tutorial Environments for use in various courses.

Strengths and Weaknesses: The Barson model is a first in terms of flow-charting instructional development procedures. It had a significant

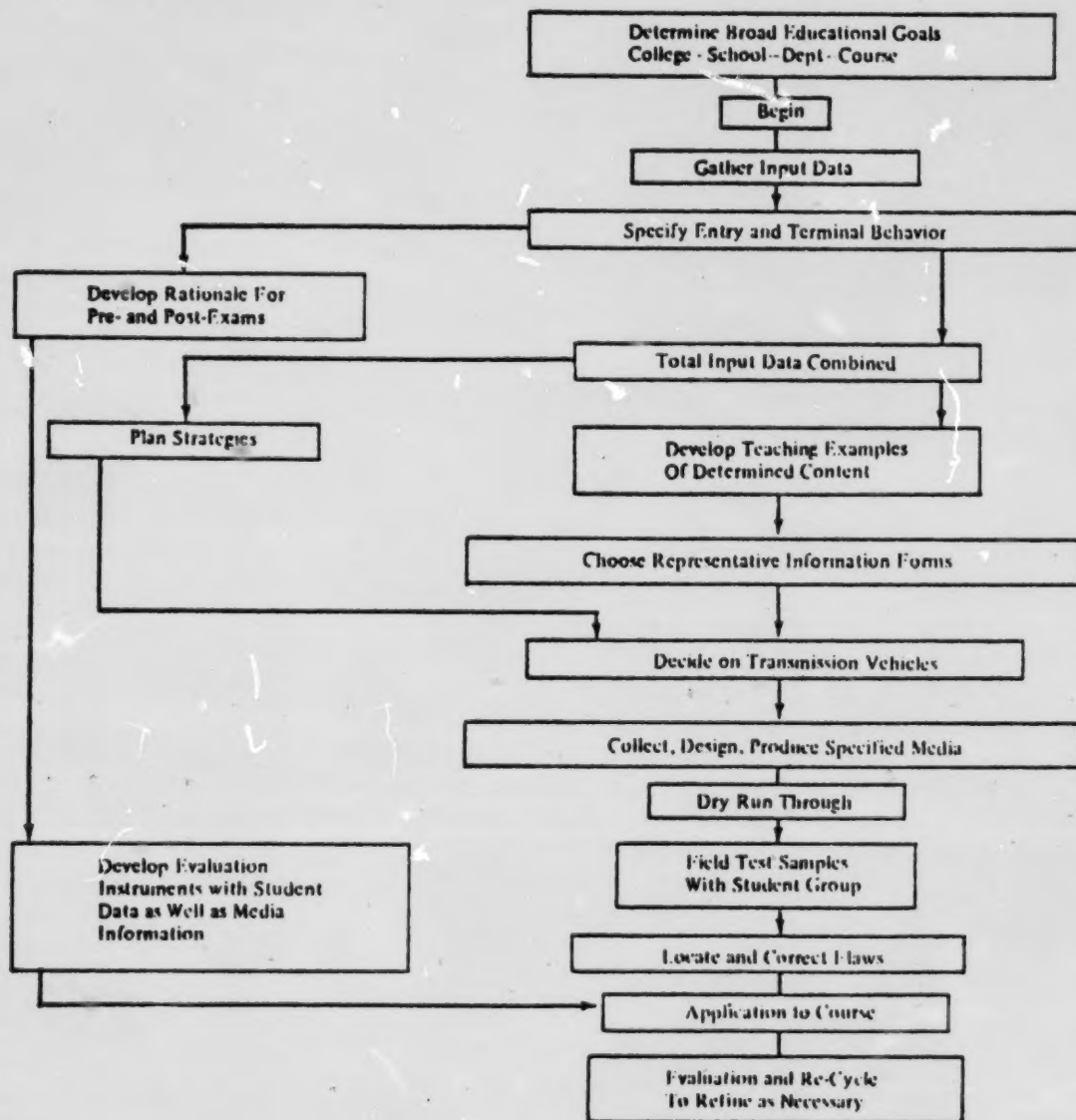


Figure 2

Michigan State Model

influence in encouraging other developers to systematize their efforts through model building. As a conceptual model for instructional development and as a catalyst for more refined procedural models, Barson's model has contributed significantly to the field. The model permits several major activities to occur at the same time as shown in Figure 2.

Limited pilot testing and more extensive data collection are also included. However, the rather general nature of the model makes it too vague to be useful for developers of instruction. Beyond limited directions provided in the flowchart, few specific application procedures are detailed, thus limiting the utility of the Michigan State Model for practitioners.

Name of Model: Project MINERVA Instructional Systems Design

Developer: William R. Tracey

Date: 1967

Description of Model: The MINERVA model was designed for the U.S. Army Security Agency Training Center. It was used for planning the complete renovation of their training programs. Essentially a systems approach, the model is designed for use as a management aid for analysis and development of suitable training courses.

The MINERVA model specifies 11 steps encompassing the collection of job data, the identification of requirements, the formulation of objectives, and the production of materials/tests, and evaluation. Provision is made for following-up graduates by monitoring subsequent on-the-job performance and comments. These new job data are collected for recycling of requirements and instruction. The model has also found broad

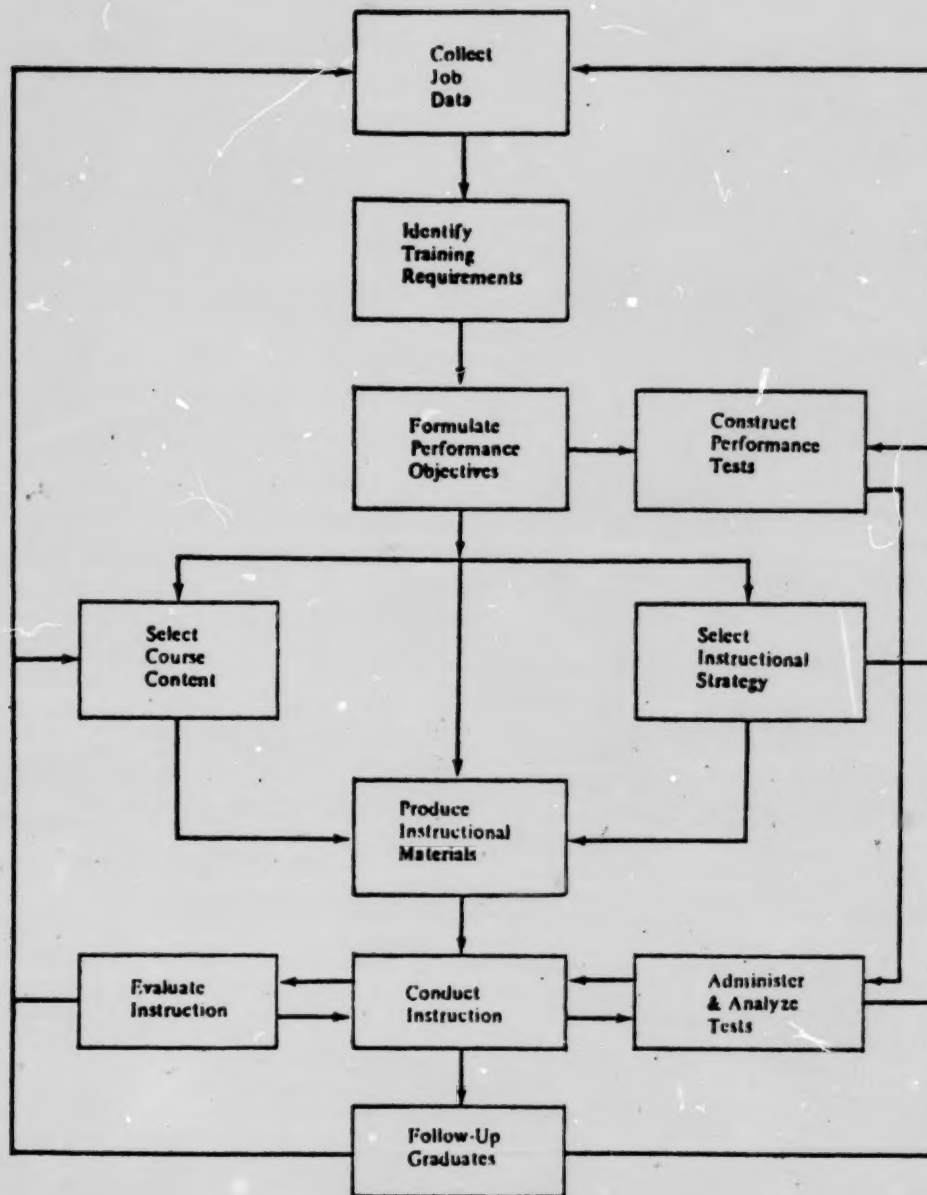


Figure 3

Project Minerva Model

application in the development of vocational education programs at the secondary level.

Strengths and Weaknesses: This "closed loop" model takes into account the pragmatic nature of military training with a needs assessment based on "out-in-the-real-world" data collection. The model proceeds in linear fashion but still provides for parallel activities (e.g., performance test construction, course content selection, and strategy selection). A unique feature of the model is its closed-cycle monitoring of graduates for subsequent revision of instruction.

The model appears overly simplified. It is more applicable to training courses and limited production than to complex educational tasks. Its follow-up approach suggests a procedure more suited to the military and to areas where application immediately follows instruction. The model does not require an analysis of the learner or his environment, nor does it attempt to establish entry-level behaviors. While the model stresses a validation stage, no suggestions for intermediate formative evaluation are presented.

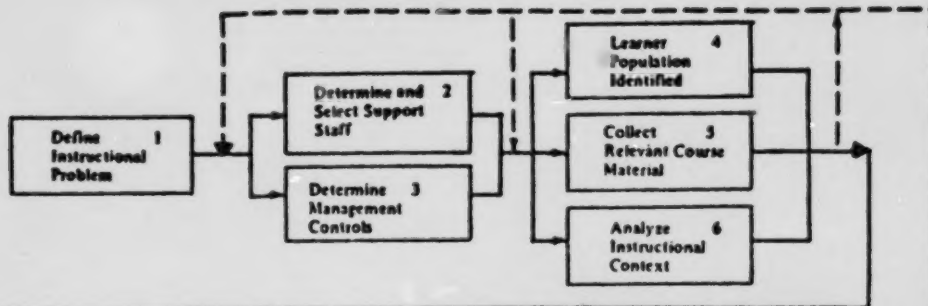
Name of Model: Teaching Research System

Developer: Dale G. Hamreus

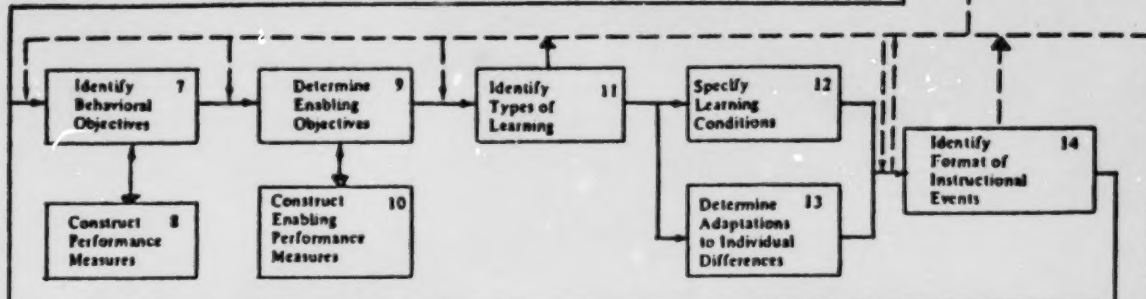
Date: 1968

Description of Model: This model was originally developed for use by professional instructional technologists and developers of instructional materials. It encompasses three main stages of development: a definition and management stage, a design stage, and a development and assessment stage. Twenty-two steps, each with provisions for feedback and

System
Definition
and
Management
Stage



Design
Analysis
Stage



Develop-
ment and
Assessment
Stage

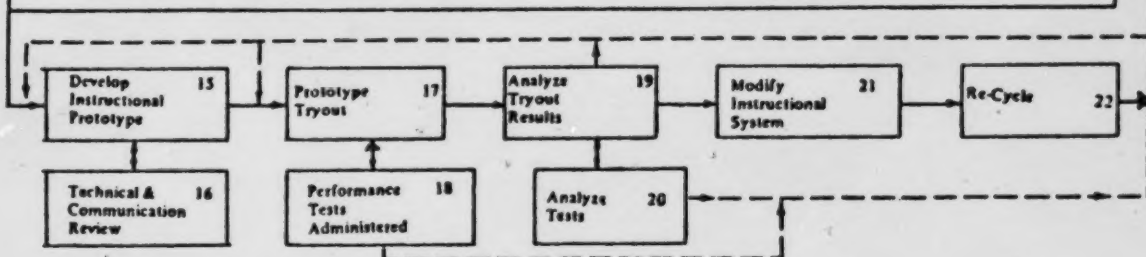


Figure 4
Teaching Research Model

recycling, are identified in the process.

In the initial stage, the instructional problem is identified, the development team and controls are established, and the learners and constraints are identified and analyzed. The second stage establishes objectives, criterion measures, types of learning, environmental conditions, and format. The development and assessment stage deals with prototype production, tryout, modification, and recycling. Projects which have employed this development model include the Dental Anatomy Program of the University of Oregon Dental School, the Modern Rhythm Film Loop Project for Washington High School, and the Instructional Simulation Materials for Teacher Education.

Strengths and Weaknesses: The model provides unique features which earlier models have omitted, particularly the attention paid to support staff selection, management controls, and technical and communications review. Specification of enabling objectives and determination of adaptations to individual differences are other distinctive features. Another strength of Hamreus' model lies in its detailing of what is needed at each step in the development process.

One of the weaknesses of the model is the linearity which implies that the development process requires completion of one step before the others may be initiated. A second drawback is in the labeling of "Develop instructional prototype" as simply one more step in the development of instruction without sufficiently detailing the complexity. Additionally, although performance data are collected and analyzed throughout the model, specific planning for summative evaluation and validation of the final product is omitted.

Name of Model: Faris-Stowe Instructional Development Model

Developer: Gene Faris and Richard Stowe

Date: 1968

Description of Model: This model was designed to provide instructors at the university level with a systematic and logical sequence of steps for the development of units of instruction each of approximately 18 hours of student-learning time. Each unit requires analyses of learners' goals, strategies, and resources, as well as a synthesis, evaluation, and revision. At what is termed the "message level," a series of analysis and synthesis steps are presented. At any step, feedback loops return to any other step, creating a dynamic flow throughout the development process. Although team work in instructional development is encouraged, the model implies that a trained instructor can perform all necessary steps in the development of his/her own instruction. The model has been applied at Indiana University in the development of a number of units of instruction.

Strengths and Weaknesses: This model presents a series of logically connected steps in the development sequence which appear manageable and operationalizable. The dynamic feedforward-feedback loops avoid the rigidity of most linear models, and the emphasis on formative evaluation at every stage of development, as well as within each step, suggests a flexibility which sets this model apart from most others.

The primary weakness of the model is that it does not explain how each step is operationalized. How one goes about developing unit goals, for example, or specifying entry and terminal behaviors is not clearly explained. The second weakness is the formidable nature of the model in

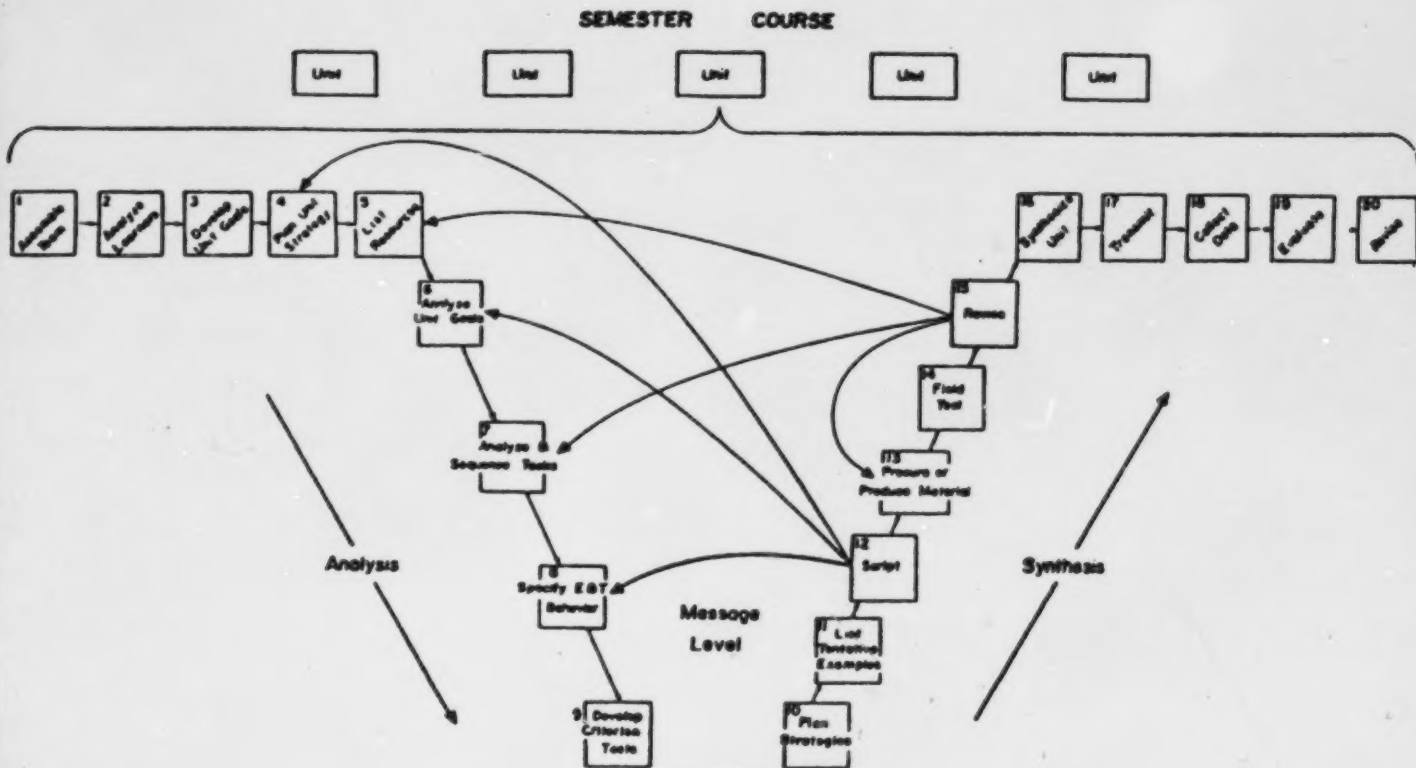


Figure 5
Faris-Stove Model

terms of each unit of instruction. It is apparent that an enormous amount of time and effort is required before an instructor can apply the model as it stands. Finally, insufficient details are provided for the design of packaged instructional units. Questions of mediation and evaluation are dealt with at too global a level.

Name of Model: Banathy Instructional Development System Model

Developer: Bela H. Banathy

Date: 1968

Description of Model: Banathy is concerned with the learner as the center around which instruction is to be developed. This model focuses on making decisions about what is to be learned, how, by whom, and under what conditions. Additional steps include decision points for evaluation procedures, strategies, resources, and time requirements. The major concerns of the model are life analysis and formulation of learning tasks, system design, testing, implementation and quality control, and change for improvement of the system. These activities are all geared toward establishing the precise tasks the learner must achieve, as well as the conditions for achievement. The model has been employed for course development at higher education levels.

Strengths and Weaknesses: Emphasis on the learner and on decision making procedures is a strong feature of this model. Each major phase of the process is contained within a closed system with feedback paths interspersed among all of these stages. This implies a constant monitoring and refining in the development process. However, from an application point of view, the Banathy model does not provide specific details to the uninitiated. Formative evaluation procedures are not explained and

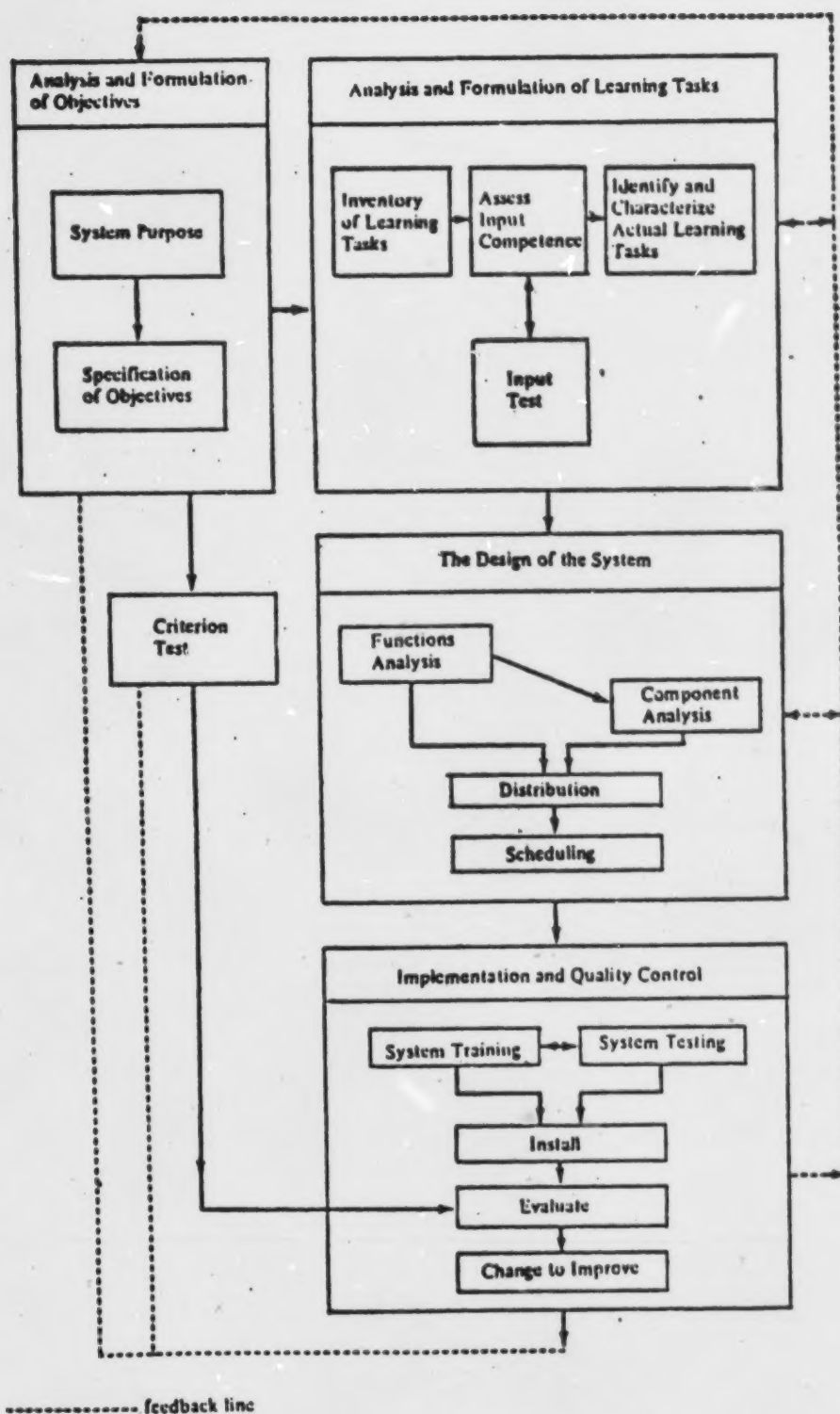


Figure 6
Banathy Model

final evaluation receives only the briefest handling. Once again, as with most other models, the very necessary details and specific procedures for production and evaluation are lacking.

Name of Model: IDI (Instructional Development Institute) Model

Developer: National Special Media Institute

Date: 1970

Description of Model: The National Special Media Institute, now the University Consortium for Instructional Development and Technology, has revised and compressed Hamreus' Teaching Research System (1967) into a nine-step instructional development model suitable for use by teachers and specialists in the educational field. The model is elaborated in a series of five manuals. Each member of the consortium--Syracuse University, Michigan State University, Oregon State Department of Education, University of Southern California, and Indiana University--has been responsible for the elaboration of one of the manuals. The model is divided into three main steps: define, develop, and evaluate. A series of explanations regarding what should be done at each step accompanies the flowchart (Fig. 7). The IDI model has had very broad dissemination, particularly through the numerous workshops the consortium runs each year.

Strengths and Weaknesses: The major strength of the model is the fact that it is straightforward and can be read easily. The fact that the model has been disseminated to many public school systems and institutions of higher learning demonstrates a strength inherent in the consortium approach. On the other hand, the linear approach of the model tends to oversimplify the dynamics of instructional development. In fact, data collected in workshop follow-ups show extremely diverse reactions and

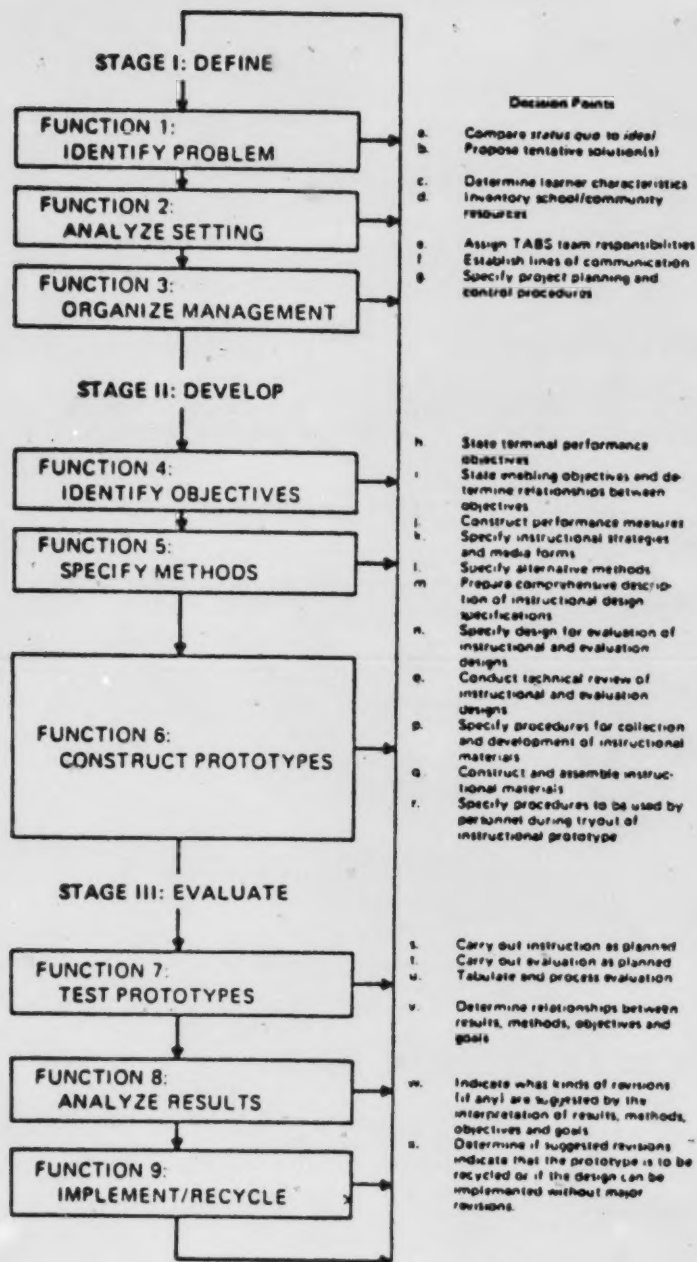


Figure 7
IDI Model

achievements. Another weakness is the different style and approach taken by each of the manuals in elaborating the model; each member of the consortium has prepared one manual, and a lack of consistency is evident.

Name of Model: Briggs' Design of Instruction Model

Developer: Leslie J. Briggs

Date: 1970

Description of Model: The Briggs' Model is more concerned with the actual design of instruction than the more global development approach. For this reason, the model begins with a design stage. Specifications of objectives are listed, based on practical needs, theoretical considerations, and future requirements. Criterion-referenced tests corresponding to the objectives are developed next. The objectives are then analyzed to identify the tasks and competencies the learner must master to attain each objective. Learning types are identified using Gagné's eight types of learning. The instructional sequence is then determined. Once the content has been specified and tasks identified and sequenced, entry-level requirements on the part of the learners are determined. Tests to assess entry competencies are designed, and alternative strategies prescribed to deal with those below the entry criterion. Media selection and allocation are based on detailed consideration of the characteristics of each medium. In the development stage, suggestions are provided for the production of "first-draft" materials. Formative evaluation of these materials follows, using small group testing, revision and further testing. Finally, after field testing with larger groups, summative evaluation is carried out, with final revisions permitted if the evaluation data are not satisfactory.

FLOW CHART: A Model for the Design of Instruction

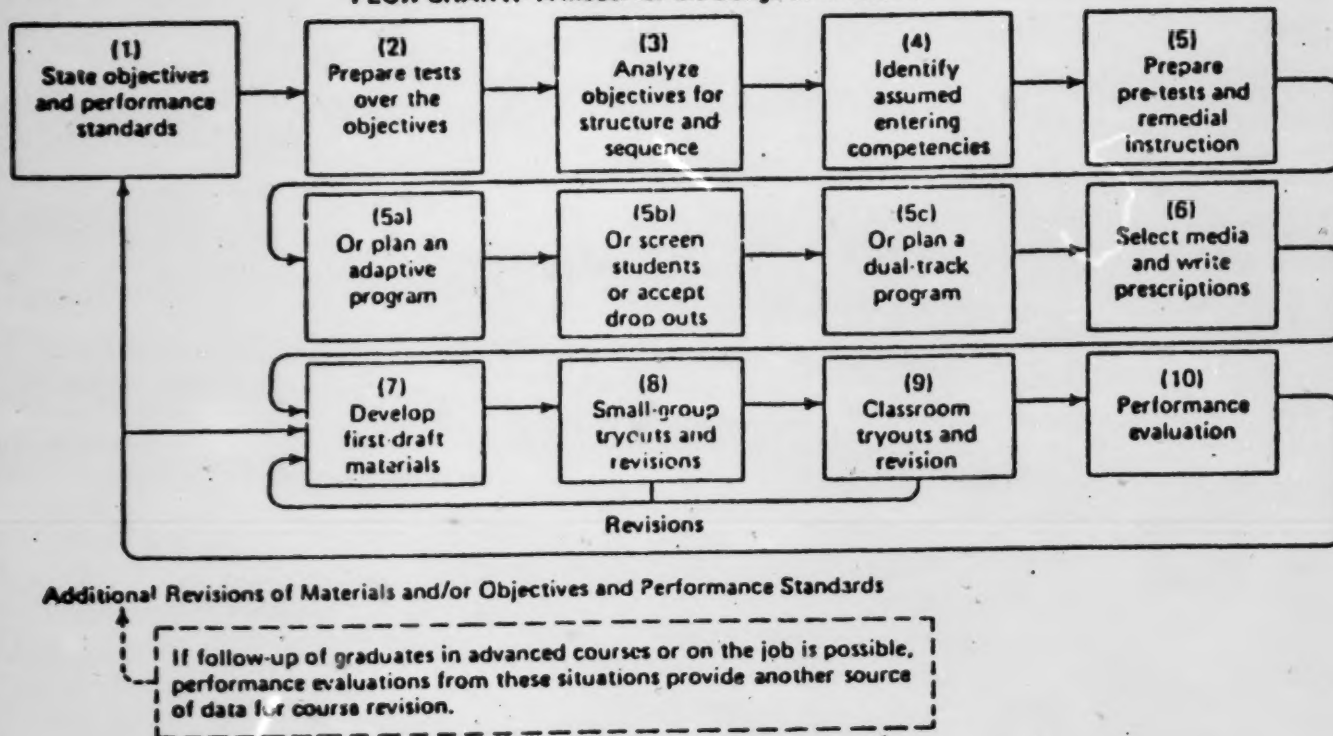


Figure 8

Briggs Design of Instruction Model

This 10-step model with copious explanatory materials has received very broad attention. It has been used for the development of instructional materials and programs at all levels of education.

Strengths and Weaknesses: Briggs' model is one of the most carefully elaborated and detailed instructional design models in existence. Guidelines for each step of the process are fully explained with practical suggestions and examples. Briggs, an expert in the field of media selection (e.g., Briggs, Campeau, Gagné and May, 1967), has applied a rigorous and systematic approach to the use of media in instruction. His consideration of long-term follow-up of graduates as input data for future revisions is a unique feature.

The major weaknesses of the model are the nature of the guidelines. For small-scale, part-time nonprofessional developers/designers of instruction, the systematic approach is made to appear as a very complex process with over 200 pages of advice, but with only selected parts of it applicable to their own problem. For the producer of instructional modules with a specific set of media in mind, there are too few details. For example, the topic of filmstrip production is handled in twelve lines.

Related to this is the unevenness with which various steps are handled. For example, the process of media selection is discussed in minute detail, whereas needs assessment is not even mentioned. The model presupposes a certain degree of developer sophistication which is not always found in part-time workers or non-specialists; this limits widespread application of this model in smaller projects.

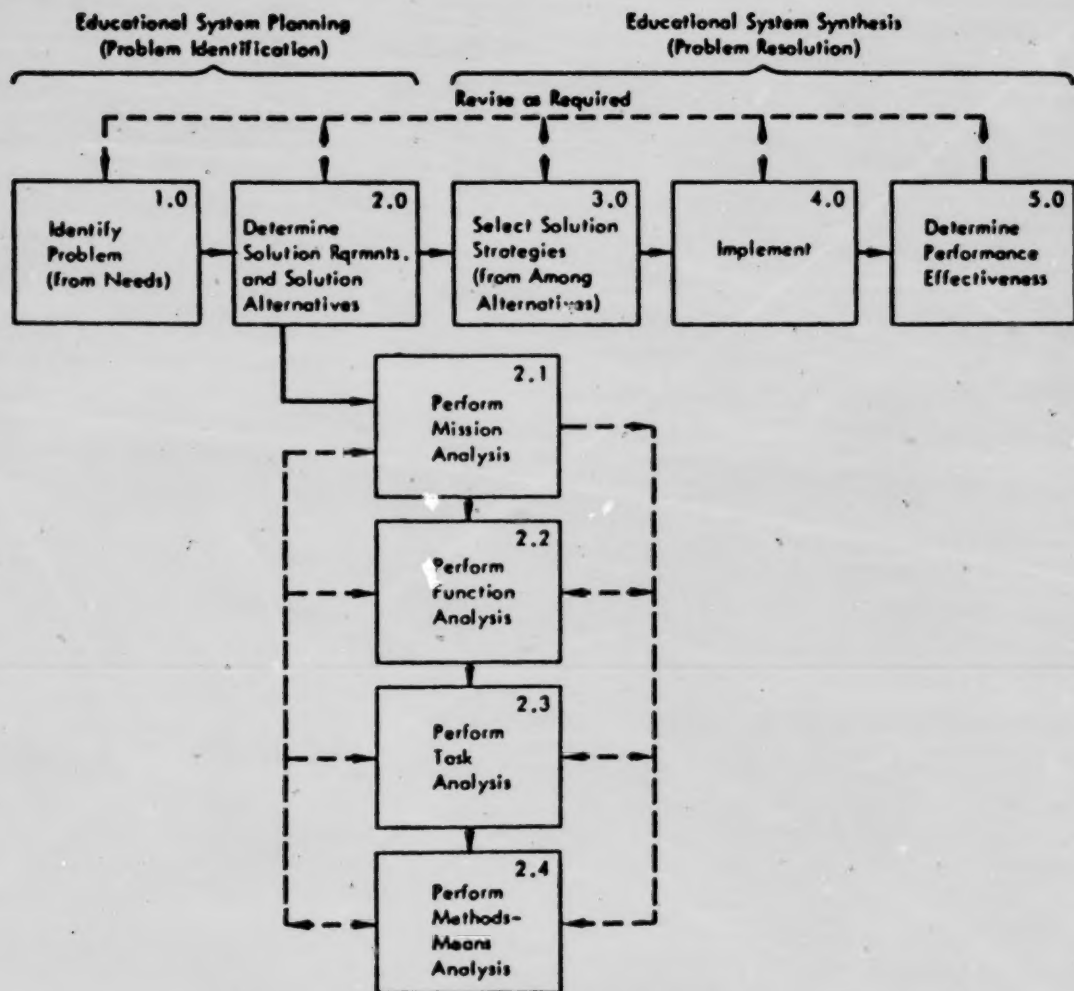
Name of Model: Kaufman Model

Developer: Roger A. Kaufman

Date: 1972

Description of Model: Kaufman's approach to the solution of educational problems and instructional development is management-oriented. Using a six-step management process model, Kaufman identifies these elements which must be dealt with in solving educational problems: (1) identify problem (based on documented needs), (2) determine solution requirements and solution alternatives, (3) select solution strategies (from among the alternatives), (4) implement selected strategies to achieve the required outcomes, (5) determine performance effectiveness, and (6) revise as required at any step in the process. The first two steps are considered part of problem identification, the last four of problem resolution. All six steps are seen as forming a continuous process. The major thrust of the model is problem identification with emphasis on the tools, procedures, and logic of needs assessment and system analysis. Design requirements are only considered in relation to planning.

Strengths and Weaknesses: Kaufman's model takes a very well-conceived, highly systematized approach to the analysis aspect of instructional development. Perhaps more than any other model, it details in a consistently logical flow the numerous component elements at different levels of analytic procedures. Mission analysis (which asks what the goals are and when one knows they have been achieved), functional analysis (which is a form of mission analysis on a component function level), task analysis, and methods-means analysis (which considers alternate strategies and approaches for achieving objectives) are all spelled out in



careful detail with accompanying flowcharts. Terminology is also defined in straightforward language.

The weakness of the model lies in the synthesis stage. In terms of actual design, the model provides few operational cues. Practical suggestions on how to go about carrying out the solutions which have been identified are lacking. Furthermore, although Kaufman considers evaluation and revision as "keys to self-renewal, relevancy, and responsiveness," (p. 139) both formative and summative evaluation are treated lightly. When considering the actual operational needs of the developer this model appears weakest.

Name of Model: Great Plains National Model/Process for Instructional Design

Developer: Edward Cavert

Date: 1974

Description of Model: This model required five years of development and implementation to arrive at its present form. The model starts from a media base of instructional television and attempts to apply a systems approach to the design/development of instruction. The model accepts as an a priori condition that not all of its guidelines should be rigidly adhered to, since, for example, not every stimulus in a television program can be expected to produce a direct and measurable response from the learner. Nevertheless, the model maintains that a major responsibility of the developer is to discipline himself within rigid tolerances in the design, execution and assessment of success.

The graphic illustration of the process in this model (Fig. 10) is unusual. Selection of the target audience and analysis of the individual learner in relation to his environment are the first major steps. In-

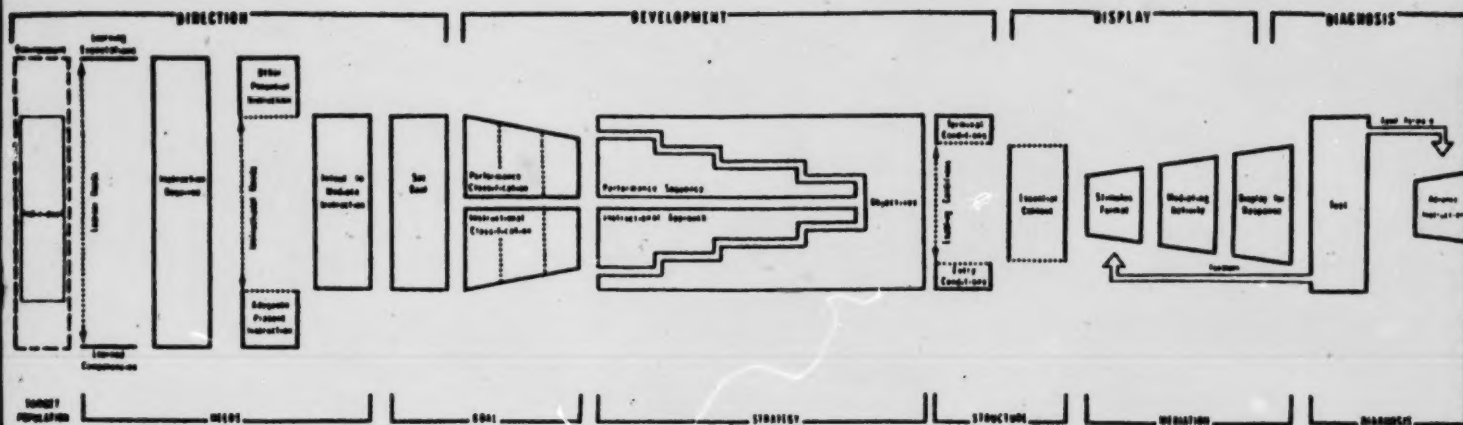


Figure 10

Great Plains National Procedures for Instructional Design

dividual needs are stressed, and as homogeneous a population as possible is considered most desirable--the argument being that any type of learner, given a large population, can still make television viable. Careful examination of needs, goals, strategy, structure, mediation and diagnosis is performed in terms of the target population. Provision is made for validation at the end of successive revisions.

This model has received strong approval and encouragement from the United States Office of Education (USOE) and the Association for Educational Communications and Technology (AECT) as "the only major commitment to the application of systems analysis and common sense to the design of instructional television" ("Procedures for instructional design: Proceedings of the 1972 Lincoln leadership conference on instructional design, 1972). It has been extensively applied in the state of Nebraska and other states concerned with ITV (e.g., Office of Public Instruction for the State of Illinois; Duval County Schools, Florida; Shawnee Mission Public Schools, Kansas).

Strengths and Weaknesses: This series of guidelines makes no pretense at offering any new conceptual contribution to systems theory. Rather its strength lies in its tight, logically conceived approach developed through practical field work and extensive revision on the basis of user feedback. In this respect the procedures have been validated through use by experienced producers in the design of instructional television and have shown application to other media as well. There is a strong commitment to needs assessment but the guidelines are not sufficiently clear as to how one actually goes about conducting one or how a developer interprets the results obtained. A unique feature of the model is its emphasis on mediation and how this relates to specification

of objectives. Another strength is the steps which are indicated for going beyond testing to some form of validation. Although validation has assumed a broad variety of meanings, this model provides an operational description of this important concept.

One of the shortcomings of the model is the omission of any guidelines or discussion as to what effect the television medium might have on learning. No methods are suggested for anticipating the impact of the medium itself on the design of instruction. The model does attempt to offer guidelines which can be generalized to instructional programs other than those designed for television. However, the television approach is very much in evidence and the mass audience as opposed to the individual learner receives more attention.

Name of Model: Wong/Raulerson Systems Model of Instruction

Developers: Martin R. Wong and John D. Raulerson

Date: 1974

Description of Model: This model for instructional design is aimed toward classroom users. Its main purpose is "to bring together some of the principles, theories and applications from relevant fields . . . and to organize them into a brief understandable package that will help teachers and instructional designers" (p. 3). The model identifies preassessment, instructional design, the instructional process, and post-assessment as the basic functions carried out by any good teacher. Through continuous feedback about progress toward the learner's goals, the model applies a systematic orientation to these functions. Emphasis at all stages is upon immediate practical application to on-going classroom activities.

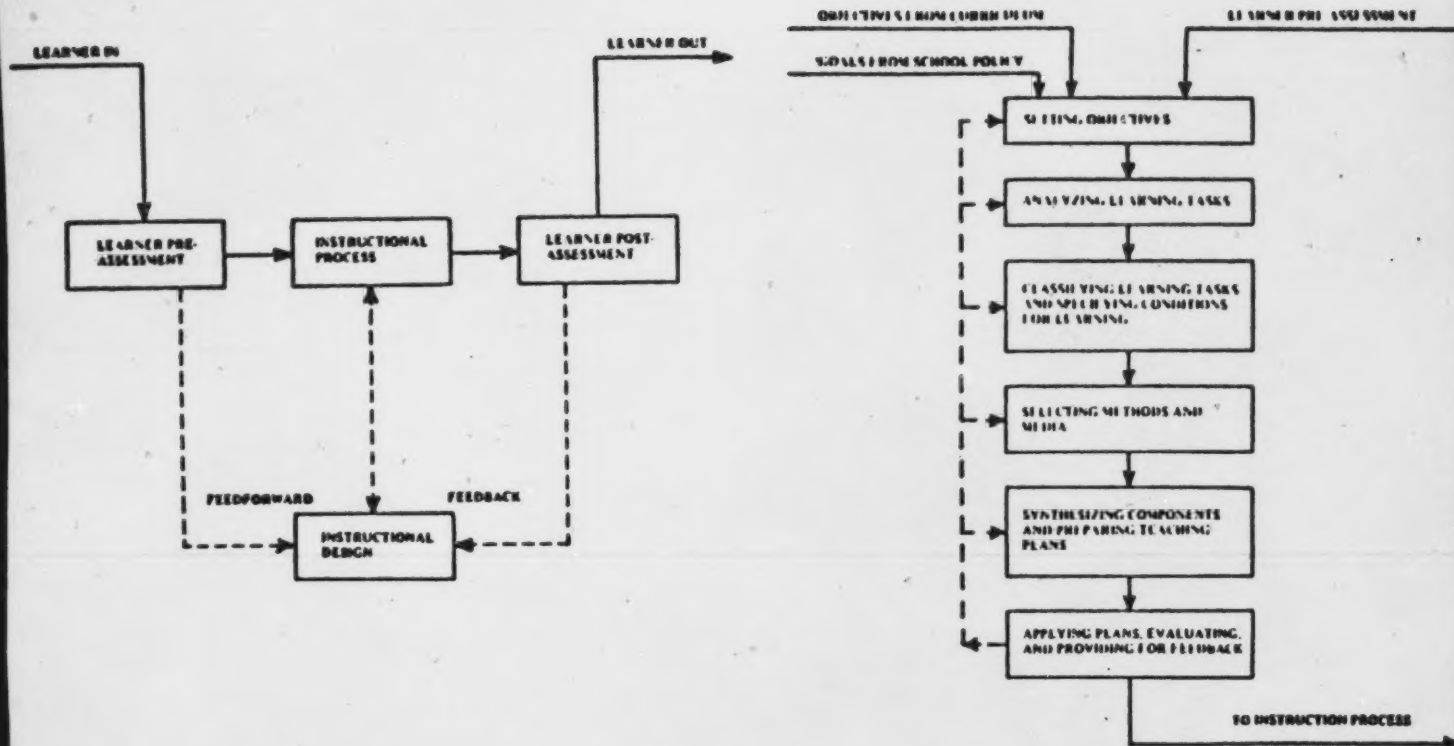


Figure 11
Wong/Raulerson Model

Strengths and Weaknesses: One of the most appealing aspects of the model is its simplicity and unimposing terminology. The thrust is so practical that most teachers or course planners do not feel threatened at attempting a "systems" approach. Objectives are discussed in a semi-cookbook fashion with a rationale that is expressed in terms of classroom needs. Topics such as entry behavior and task analysis are treated directly through step-by-step guides. The model deals with media selection in detail and provides a medium/attribute matrix which is unusual in most instructional development models. Its selection process seems to borrow heavily from McConnell (1974), offering a practical guide to nonspecialists who need to know which media they should use.

In their desire to translate systematic development into immediate classroom application by the nonspecialist, Wong and Raulerson leave out many components generally considered essential elements of instructional development. Needs assessment and context analysis are not even mentioned. In addition, the model takes an entirely linear approach, which implies that one step must be completed before the next is undertaken.

This instructional design model is unusual in that it is directed toward implementation within a clearly defined and narrow context. Application to more complex problems is not even considered.

Name of Model: 4-D Model

Developer: Sivasailam Thiagarajan, Dorothy Semmel & Melvyn I. Semmel

Date: 1974

Description of Model: The 4-D Model views instructional development in terms of four major stages. In the "define" stage, needs, learners, content, tasks, and concepts are analyzed, with any or all of these activities

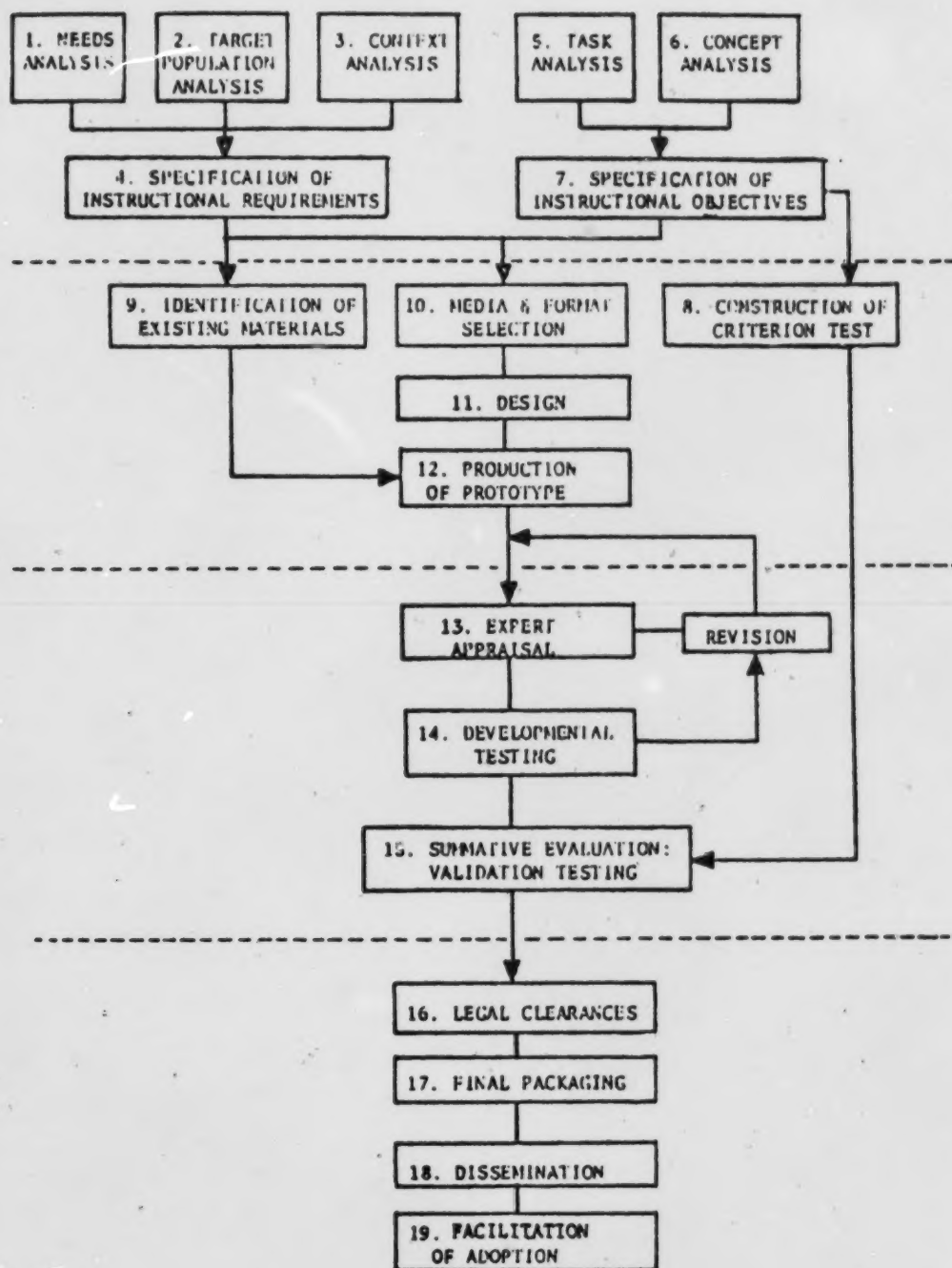


Figure 12

4-D Model

being carried on simultaneously according to resources. On the basis of these analyses, requirements and objectives are specified and harmonized to become the criteria for the "design" stage. Search for existing materials, criterion tests and blueprinting of needed components result in a prototype which during the "develop" stage goes through student and expert evaluations. After the instructional product or program has been validated, steps for dissemination are outlined. Throughout the model, emphasis is placed on constant feedback and revision. In addition to learner testing, expert appraisal is solicited to aid in design modifications.

This model has been conceptualized and refined on the basis of the needs of teacher training in particular. It has been used to develop graduate courses and workshops and a large number of self-instructional packages and simulation games.

Strengths and Weaknesses: In terms of both concept and application, the 4-D Model makes an attempt at comprehensiveness. Not only does it begin with a thorough analysis of what is to be developed and for whom, but also lays a strong foundation for the development activities by performing a careful needs assessment. An unusual feature of the model is the follow-through after design and development to dissemination of the instructional product. Although dissemination is presented as a set of considerations only after validation--a linear weakness--the issue is nevertheless dealt with in practical detail.

Four other features stand out in the elaboration of the model. One is its emphasis on competency-based education. The second is the media and format selection guidelines which provide a large set of alternatives,

including extensive consideration of media attributes, use of protocols and resource management formats. A third distinctive feature is the inclusion of expert appraisal, both at early points in the analysis and design stages as well as for prototype evaluation. The fourth element is the emphasis placed on final package evaluation and the discussion of alternative approaches to validation testing.

The major weakness of the 4-D Model is that by telling much, it does not quite tell enough. In dealing with particular problems of program and product design the steps are not specific enough. As with all macro models, design/production suggestions tend to be too general to meet the day-to-day needs of developers. The elements are there, but the details are missing.

A Comparison of Instructional Development Models

The models described above are only a sample of the large number which appear in the literature. They have been selected for their representativeness of all generalized ID models. How closely do they resemble one another? In Table 1 a matrix is presented to compare the activities each model considers essential. The 29 activity categories listed have been derived from an examination of some 20 models and then reapplied to the 12 models under consideration. Where the activity is specifically prescribed in the model, a "P" is shown. Where the particular activity is implied, but not directly prescribed, an "I" is used. If the model does not consider the activity at all, an "O" is shown.

As the table indicates, there is general agreement on the majority of steps which must be included. Differences among models are more in terms of their points of origin (e.g., Kaufman is interested in systems

Table 1

A Comparison of Instructional Development Systems Models

INSTRUCTIONAL DEVELOPMENT SYSTEMS MODELS												
ACTIVITIES	Briggs Design of Instruction Model 4-D Model 101 Model Kaufman Model Long/Paulson System Model of Instruction Great Plains National Development Model Samahy Instructional Development System Model Faris-Stowe Instructional Development Model NIHERVA Model Michigan State University Instructional Systems Development Model SAFE Model Teaching Research Model											
	Briggs Design of Instruction Model	4-D Model	101 Model	Kaufman Model	Long/Paulson System Model of Instruction	Great Plains National Development Model	Samahy Instructional Development System Model	Faris-Stowe Instructional Development Model	NIHERVA Model	Michigan State University Instructional Systems Development Model	SAFE Model	Teaching Research Model
Needs assessment	0	P	P	P	0	P	P	P	P	0	0	P
Project team information	0	0	P	0	0	0	P	0	0	0	0	P
Specification of I.O. team management procedures	0	0	P	0	0	0	0	0	0	0	P	P
Learner analysis	P	P	P	P	P	P	P	P	P	P	P	P
Task/content/concept analysis	P	P	P	P	P	P	P	P	P	P	P	P
Context analysis	0	P	P	P	P	P	P	P	P	P	P	P
Specification of instructional requirements	P	P	P	P	P	P	P	P	P	P	P	P
Specification of objectives	P	P	P	P	P	P	P	P	P	P	P	P
Specification of tentative solution	0	0	P	P	0	P	0	0	0	0	0	0
Specification of entry-level prerequisites	P	P	0	P	P	P	P	0	0	0	0	P
Construction of pre/entry tests	P	P	P	P	P	P	P	0	0	0	0	P
Identification of types of learning	P	P	0	0	P	0	0	0	0	0	0	P
Specifications for remedial instruction	P	0	0	0	0	0	0	0	0	0	0	P
Construction of criterion tests	P	P	P	P	P	P	P	P	P	P	P	P
Media/format selection	P	P	P	P	P	P	P	P	P	P	P	P
Specification of methods strategies	P	P	P	P	P	P	P	P	P	P	P	P
Prototype specifications	P	P	P	P	P	P	P	P	P	P	P	P
Prototype production	P	P	P	P	P	P	P	P	P	P	P	P
Evaluation design	P	P	P	P	P	P	P	P	P	P	P	P
Expert appraisal	0	P	P	0	0	0	0	0	0	0	0	0
Student testing	P	P	P	P	P	P	P	P	P	P	P	P
Data analysis	P	P	P	P	P	P	P	P	P	P	P	P
Modification	P	P	P	P	P	P	P	P	P	P	P	P
Recycling	P	P	P	P	P	P	P	P	P	P	P	P
Field testing	P	P	P	P	P	P	P	P	P	P	P	P
Summative evaluation	P	P	P	P	0	P	0	0	0	0	0	0
Final packaging	P	P	0	0	0	0	0	0	0	0	0	0
Dissemination	P	P	0	0	0	0	0	0	0	0	0	0
Long range formative evaluation	P	0	0	0	0	0	0	0	0	0	0	0

P= Activity prescribed
 I= Activity implied
 0= Activity not considered

planning and management; Cavert has a strong ITV bias; the MINERVA model is more suited to vocational training) rather than in radically different ways of developing instructional programs and products. They are all united by their strong commitment to a systems approach.

The problem investigated in this study was to adapt one of these generic models to a more specific procedural model dealing with a particular media combination. The 4-D model was chosen as the base for adaptation because of its relatively comprehensive nature as indicated in Table 1. In addition, the investigator's familiarity with the model and easy access to the original designers were among the pragmatic considerations which resulted in the selection of this particular model. Before it could be adapted to a specific media combination, however, an appropriate combination had to be identified. A selective review of media-selection strategies was undertaken to assist the investigator in this process.

Media-Selection Strategies

The one activity which appears with unfailing regularity in different instructional development models is that of media selection. Builders of these models have paid considerable attention to this task but they have been outdone by other experts who specialize in this area. Thus, while media selection is only a box in various instructional development flowcharts, it has been magnified into full-blown models by media specialists. In the following section a selective review of these media-selection strategy models is undertaken.

Allen (1967) has produced a step-by-step model for making proper use

of instructional media in teaching. He has also provided a table matching the capabilities of various media with learning objectives and has rated the potential of the media to help attain these objectives as high, medium, or low (see Table 2). In addition, Allen has produced a guide for teachers summarizing various equipment/media relationships and considerations (see Table 3). By means of his procedures and tables, Allen feels that media can be more carefully and systematically selected to attain specific instructional objectives.

Allen's approach makes an attempt to systematize the media selection process. As Kemp (1971) suggests however, ". . . while at first glance this summary seems of value . . . it is difficult to translate the generalizations into practical guides for selecting media" (p. 13). Few producers of instructional materials and even fewer consumers possess the range of materials surveyed by Allen. It does little good to know what exists--the problem is how to obtain, combine, and operate the appropriate media combination. Another weakness of Allen's model is that his classification of high, medium, and low ratings for various media relative to learning objectives is not particularly meaningful to those unfamiliar with his judgmental criteria. Nevertheless, this attempt at bringing order to what is often decided haphazardly provides a basis upon which a systematic media selection process can begin.

Another approach has been taken by Bretz (1971) of the Rand Corporation. He has developed a set of outline charts which incorporates a number of decision point questions ultimately aimed at identifying an appropriate media class for the instructional task or lesson. He asks questions which require a "yes" or "no" answer, such as the following:

Table 2
Relationships of Instructional Media Stimuli to Learning Objectives

Instructional Media Type	Learning Objectives					
	Learning Factual Information	Learning Visual Identification	Learning Principles, Concepts and Rules	Learning Procedures	Performing Skilled Perceptual Motor Acts	Developing Desirable Attitudes, Opinions & Motivations
Still Pictures	Medium	High	Medium	Medium	Low	Low
Motion Pictures	Medium	High	High	High	Medium	Medium
Television	Medium	Medium	High	Medium	Low	Medium
3-D Objects	Low	High	Low	Low	Low	Low
Audio Recordings	Medium	Low	Low	Medium	Low	Medium
Programmed Instruction	Medium	Medium	Medium	High	Low	Medium
Demonstration	Low	Medium	Low	High	Medium	Medium
Printed Textbooks	Medium	Low	Medium	Medium	Low	Medium
Oral Presentation	Medium	Low	Medium	Medium	Low	Medium

Table 3
Equipment/Media Relationships and Considerations

Instrument	Media Used	Materials Production Considerations	Availability of Facilities and Equipment	Equipment Cost
1. Filmstrip or slide projector	35mm filmstrips or 2x2 slides	Inexpensive. May be done locally in short time.	Usually available. Requires darkened room.	Low
2. Overhead transparency projector	Still pictures and graphic representations	Very inexpensive. May be done locally in short time.	Available. May be projected in light room.	Low
3. Wall charts or posters	Still pictures	Very inexpensive. May be done locally in very short time.	Available. No special equipment needed.	Very low
4. Motion pictures (projection to groups)	16mm motion picture (sound or silent)	Specially produced. Sound film is costly and requires 6-12 months time.	Usually available. Requires darkened classroom.	Moderate
5. Motion picture projection as repetitive loop (8mm silent) to individuals	8mm motion picture film (silent)	Special production normally necessary. May be produced as 16mm film alone or locally at low cost and in short time.	Not normally available. Will need to be specially procured to meet requirement of instructional program.	Low per unit but moderate for groups
6. Magnetic tape recorder	1/4" magnetic tape	Easy and inexpensive. Usually produced locally.	Available	Low
7. Record player	33 1/3, 45 or 78 rpm disk recordings	Need special recording facilities. Usually commercially made.	Usually available	Low
8. Display area	3-D models	May vary in complexity and in difficulty of production. Component parts easy to obtain.	Available	Varies from high to low
9. Television (closed-circuit)	Live presentations. Motion picture film. Videotape recordings. Still pictures.	Normally requires large and skilled production staff.	Not normally available	Moderate to high
10. Teaching machines & programmed textbooks	Programmed material	Some programs available commercially. But will normally be specially prepared for course.	Not normally available	Low per unit, but moderate for groups.
11. System combinations	Television. Motion pictures. Still pictures. Audio recordings.	Complex. Probably will be done locally to meet specific requirements.	Not normally available.	Moderate to high

Is visual recognition an objective?

Is there a significant instructional advantage in hearing narration while looking at the subject rather than reading the narration either before or after looking?

Is the manner of movement of a subject an important characteristic for recognition or description of the subject?

Kemp (1971) finds this approach to be very practical and reasonable for most media decisions. In fact, following Bretz's lead, Kemp has evolved a series of decision diagrams. Figure 13 shows a sample decision flowchart used by Kemp for arriving at the correct media to be used for independent study with students.

Kemp concedes that his approach is a "practical" method without any solid theoretical base. As Briggs (1970) suggests:

Unfortunately, it is not possible to make optimum media selection by simply following a chart or table, or "cookbook," which would say essentially, "For this competency, identify the type of learning listed in a column, find its intersection with the type of learner listed in a row, and use the medium named at the intersection. Nor is it possible to make such mechanical rules based on the instructional event to be supplied or on the basis of the subject matter involved (p. 98).

Another more recent and more elaborate plan employing flowcharts has been made by Anderson (1974). In an eight-figure series of flowcharts, he attempts to arrive at the optimal medium or media combination required for a given problem. The summary flowchart is reproduced as Figure 14. When problems become complex and multifaceted, however, these

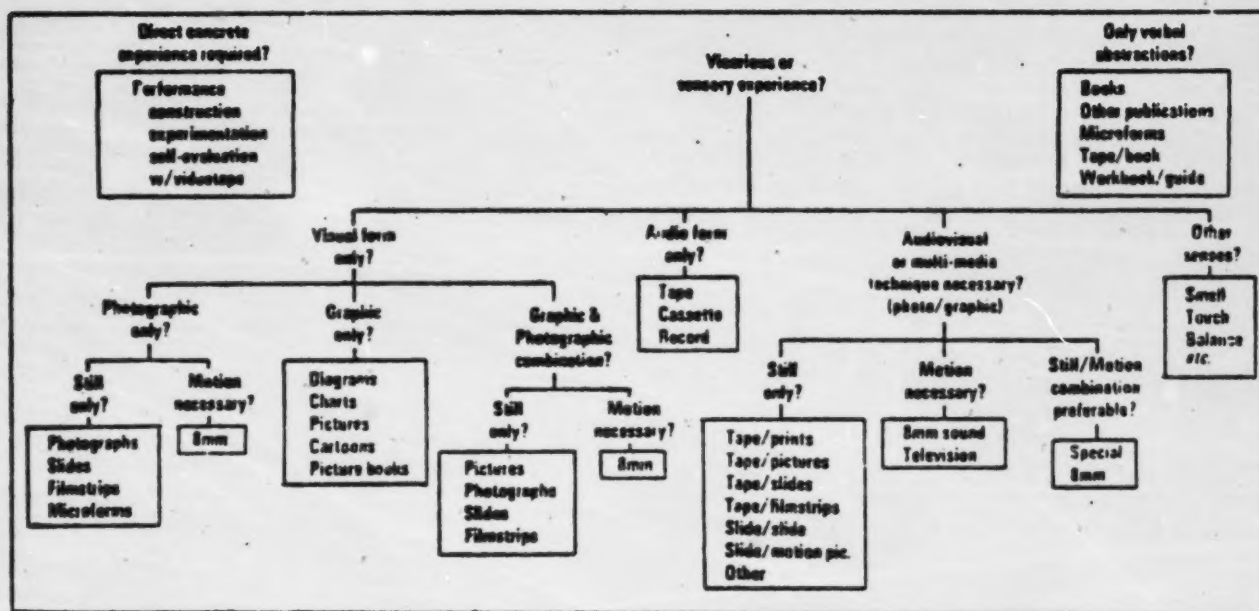
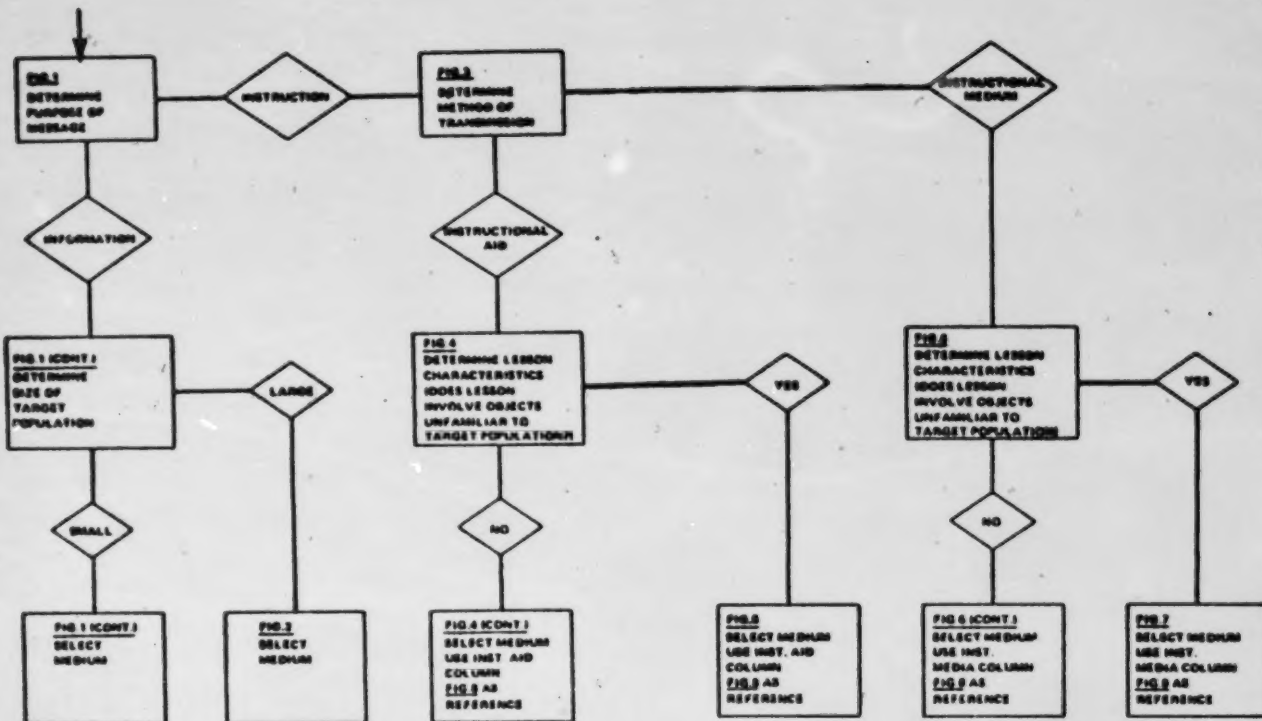


Figure 13

Independent Study for Independent Students

**SUMMARY FLOW CHART
DECISION POINTS FIG. 1-3**



AFTER SELECTION PROCESS IS COMPLETED, DEVELOPER WILL REFER TO SECTION DEALING WITH THE SPECIFIC MEDIUM SELECTED. THIS SECTION WILL PROVIDE:

1. LIST OF ADVANTAGES AND DISADVANTAGES OF THE SELECTED MEDIUM.
2. APPLICATION TO TYPES OF LEARNING.
3. SERIES OF QUESTIONS FOR EVALUATING THE SELECTION.
4. CHECKLIST OF STEPS FOR PREPARATION AND DEVELOPMENTAL TESTING OF MATERIAL.

Figure 14
Summary Flowchart for Media Selection

flowcharts lead to compromise decisions.

Complex three-dimensional paradigms of Van Mondfrans and Houser (1970) with concepts to be taught matched to stimulus characteristics of available media along one axis and to cognitive, perceptual and personality characteristics of the student groups along the other suggest another approach to systematize media selection. Wilshusen and Stowe (cited in Kemp, 1971) relate learner characteristics (instructional group size, individualization, etc.) material characteristics (reusable, time to obtain, cost, etc.) and transmission (equipment availability, instructor control, etc.) to 13 different media. These models from Van Mondfrans and Houser, and Wilshusen and Stowe show some concern for learner attributes not found in the previous models.

Goodman (1971) has produced an elaborate and highly systematized 12-step selection model which relies heavily on behavioral objectives and learner characteristics (Figure 15). At each step, inputs and products are listed. Comprehensive as this step-by-step approach is, it exhibits certain weaknesses when compared with the following five essential factors Lonigro and Eschenbrenner (1973) have derived from their careful review of media selection models. Lonigro and Eschenbrenner state that a truly comprehensive model must consider:

1. The types of learning that comprise the job task in question.
2. The degrees of proficiency desired.
3. The types of media available.
4. The degrees of proficiency realized as a function of various learning type media matches.
5. The production cost of applicable media.

Although Goodman rates high on 1, 2, 3, and 5, no provision is made

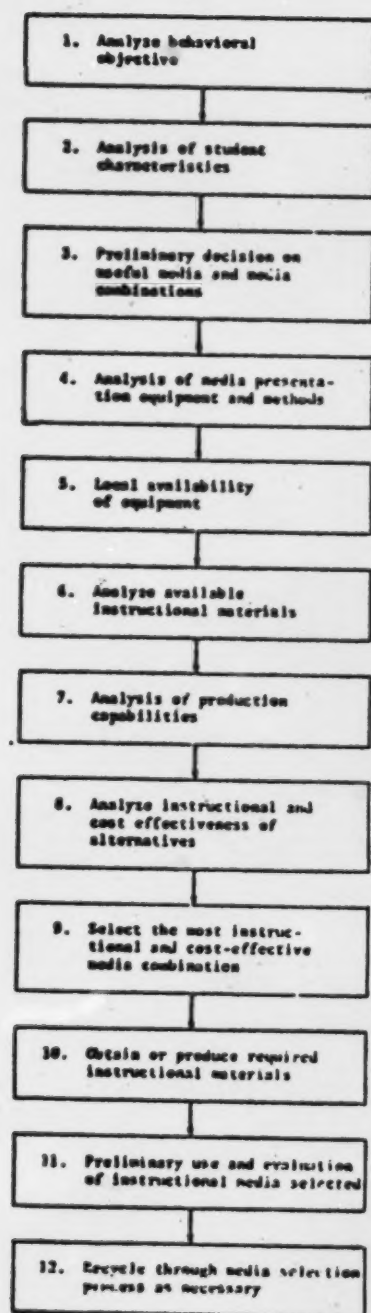


Figure 15

Goodman's "Systematic Selection Model"

for proficiency as a function of learning type-media matches, a factor stressed by Allen (1967) and others. Nevertheless, Goodman has presented a usable and systematic means of selecting media.

Among the models cited above, only Bretz and Kemp dissociate themselves from "whole" media and ask questions in terms of attributes (e.g., Is motion necessary? Is sound needed?). Levie (1974) has stated that in general most media selection models only consider the major steps depicted in Figure 16. He examines various media to see how their attributes contribute toward attainment of the instructional goals. From careful analysis of these attributes, he suggests that one can classify them as either (a) essential, (b) desirable, or (3) irrelevant to the objective in order to derive an optimal media combination. Levie's expanded or "better" model, as he terms it, is shown in Figure 17.

Thiagarajan and others (1974) have taken the Levie model a step farther by deriving a table which lists attributes in terms of popularly available media (see Table 4). In taking this step, they view media selection from a different perspective than that of Allen, Goodman, and others. They examine learner characteristics, instructional objectives, and attributes of various media to make the initial selection before application of pragmatic constraints. Having listed the desired set of attributes, the best medium or combination of media incorporating these attributes is thus identified.

McConnell (1974) has a similar model which takes a step-by-step approach to appropriate media selection. McConnell's table (Table 5), like the previous one bases the selection process on an examination of various media attributes.

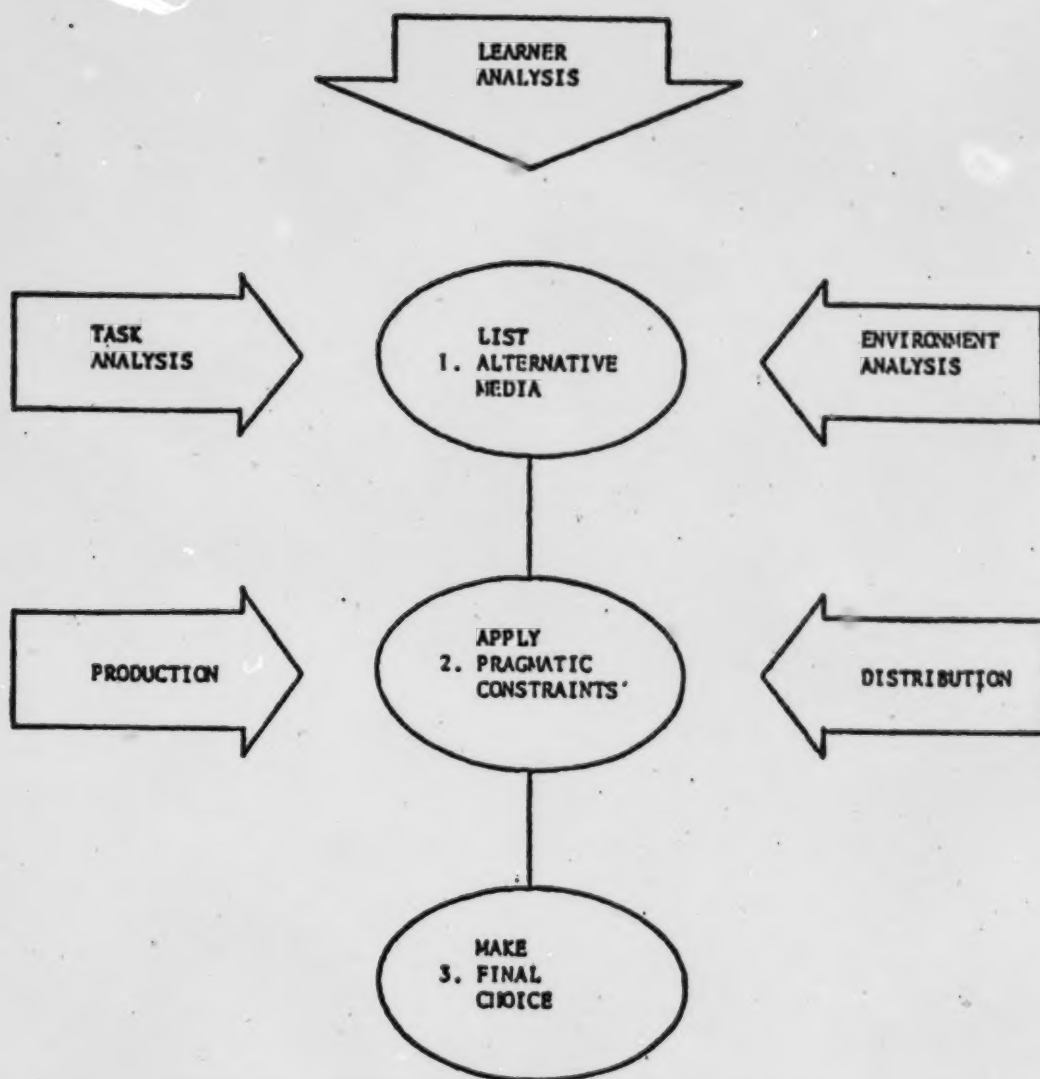


Figure 16

A Typical Model for Media Selection

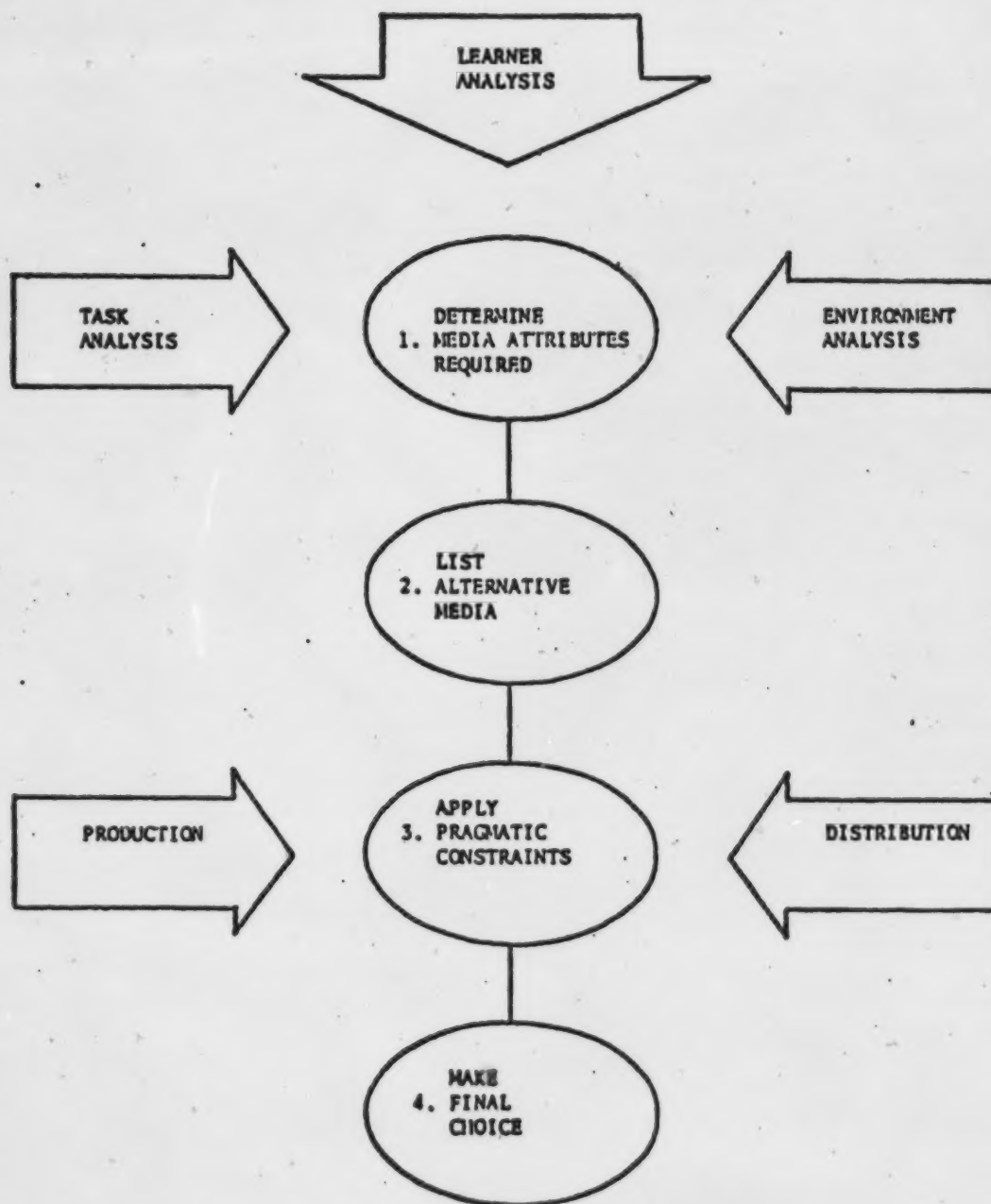


Figure 17

Table 4
Media and Their Attributes

Medium	Color	Three Dimensionality	Motion	Pacing	Random Access	Sensory Mode	Sign Type
Audiotape	----	----	----	equipment self	medium	auditory	digital
Print	yes	no	no	self	high	visual	iconic digital
Model	yes	yes	yes	self	----	visual	iconic
Real object	yes	yes	yes	self	----	visual	iconic
Filmstrip	yes	no	no	instructor	low	visual	iconic digital
Slide	yes	no	no	instructor	medium	visual	iconic digital
Overhead transparency	yes	no	no	instructor	high	visual	iconic digital
Motion picture	yes	no	yes	equipment	low	audio visual	iconic digital
Videotape	feasible	no	yes	equipment	low	audio visual	iconic digital

Table 5
Guide for Media Selection Process

Medium	Flexibility	Visual	Color	Student control over pace of learning	Motion	"Edit-ability"
Videotape reel	No, TV monitors are usually confined to a library or a classroom.	Yes	Yes and no; it depends on the type of TV monitor and TV production equipment.	No	Yes	No, editing requires much effort.
Videotape cassette	No, TV monitors and cassette players are usually confined to a library or classroom.	Yes	Yes and no; it depends on the type of TV monitor and production equipment.	Yes, the student can stop, rewind or fast forward the cassette; but learning pace is no faster than the speed of the cassette.	Yes	No, editing requires much effort.
Non-illustrated workbook	Yes, it needs no electricity and can be taken almost anywhere.	No	Yes and no; it depends on the production equipment.	Yes, the student can read it as quickly or slowly as he likes.	No	No, editing requires much effort.
Illustrated workbook	Yes, it needs no electricity and can be taken almost anywhere.	Yes	Yes and no; it is possible but very expensive.	Yes, the student can read it as quickly or slowly as he likes.	No	No, editing requires much effort.
16mm film	No, 16mm projectors are too heavy for a student to take home.	Yes	Yes	No, unless the student is skilled at running a 16mm projector.	Yes	No, editing requires much effort.
Slides with script (audio tape optional)	Yes, a slide projector can be taken anywhere where electric current is available.	Yes	Yes	Yes, the student can go through the slide script as quickly or slowly as he likes.	No, but a series of slides can break a physical activity into its sequential steps; this is sometimes better than motion for study purposes.	Yes
Audiotape	Yes, an audio cassette player can be taken almost anywhere, but you will need a set of batteries.	No	No	Yes, the student can stop, rewind or fast forward the tape but can learn only as fast as the tape runs.	No	No, editing requires much effort.

As shown in Figure 18, McConnell's paradigm requires the producer to check the qualities (i.e., attributes) a medium should have to fulfill a given objective. This is then compared with the master table, and the medium or media combination that provides all the qualities is considered the optimal choice.

For example, if the objective is that "the students will identify five types of poisonous plants," the producer checks the attributes required to attain this objective, as shown in Figure 19. Only the "slides with script" have the necessary and sufficient attributes.

Six essential factors emerge from this survey of media selection strategies:

1. Selection of media should be made systematically.
2. Selection should take into account learner characteristics.
3. Selection should take into account task characteristics.
4. Selection should take into account the pragmatic constraints of the producer.
5. Selection should take into account the pragmatic constraints of the consumer.
6. Selection should be based on the optimal combination of media attributes which match the requirements of the instructional objectives.

In summary, whatever procedure or model is used to make the media selection, the pattern shown in Figure 20 should be applied. Data on the characteristics of the learners should be collected and analyzed, including background, needs, reference groups, and the like (e.g., Is the learner deaf? Can he read? Is he paraplegic? Is he motivated

	audiotape	illus. workbook	non-illus. workbook	16mm film	videotape reel	videotape cassette	slides with script
Motion							
Color							
Flexibility							
Student-control over pace							
Visuals							

Figure 18
Media/Media Qualities Chart

		audiotape	illus. workbook	non-illus. workbook	16mm film	videotape reel	videotape cassette	slides with script
	Motion				X	X	X	
X	Color				X	X	X	X
X	Flexibility	X	X	X				X
X	Student-control over pace	X	X	X		X	X	X
X	Visuals		X		X	X	X	X

Figure 19
Completed Media/Media Qualities Chart

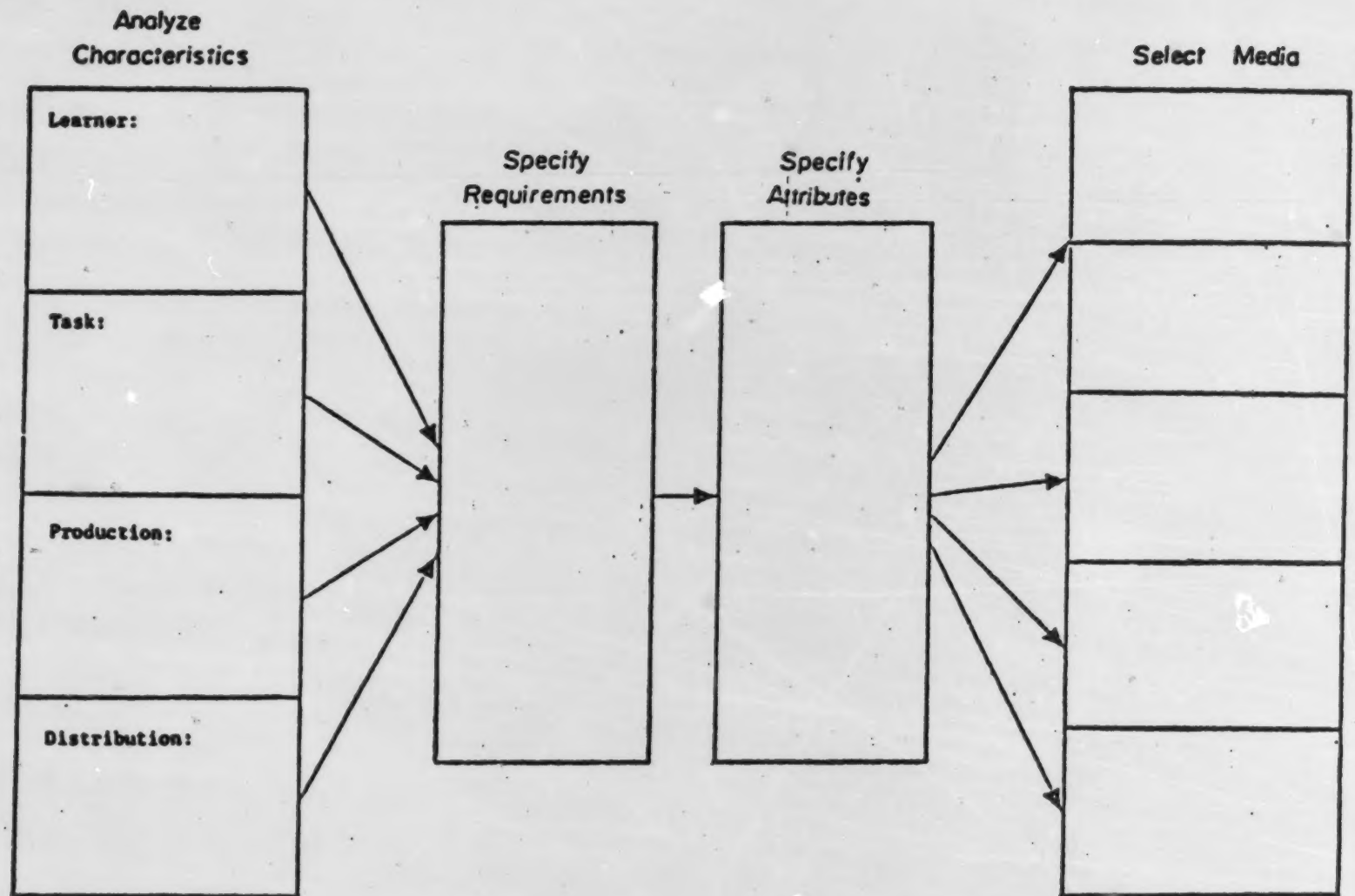


Figure 20

A Normal Media Selection Model

by film?). The instructional task should also be analyzed to determine its characteristics (e.g., Is motion involved? Is feedback required? Are sounds to be repeated?). The production features must be examined (e.g., How much time is allotted? How much is the budget? What facilities and materials are required?). And, finally, distribution characteristics must be taken into account (e.g., Is the final product to be self-contained? Will it be too expensive for consumers to afford? Do the consumers have the facilities to use it?).

Once these characteristics have been determined, specific requirements can be identified. For example, let us assume that

1. The learners are retarded children between 8 and 12 years of age who are home bound;
2. The task is to discriminate among the colors red, blue, and green;
3. The production capabilities are limited to what can be done with an SLR camera, some audio-recording equipment, a small graphics lab and one full time media person.
4. The distribution plans require parents of the learners to use the materials at home.

After these characteristics are determined, appropriate requirements can be specified. Media attributes can then be matched to these requirements. Finally, using a table such as Table 6, attributes can be matched with media for a final optimal selection. An example of this four-step process is summarized in Figure 21.

Table 6
Media/Media Attributes

		Media											
		CALL Input/output Terminal	Super 8- videotape	8- filmloop	Overhead transparency 16mm film	Slide	Filmstrip	Realia	Print	Audio tape (cassette)	Audio tape (reel)		
Media Attributes	TASK	Audio	/	X	X	X	X	X	X	X	X	X	X
		Visual	X	X	X	X	X	X	X	X	X	X	X
		Motion	/	X	X	X	/	X	X	/	/	/	/
		Color		/	X	X	/	X	X	/	/	/	/
		3-Dimensionality											
		Realism		X	X	X	/	/	/	/	/	/	/
	LEARNER	Response Acceptance	X	/	/	/	/	/		X	/	/	/
		Feedback	X	/	/	/	/	/		X	X	X	X
		Audio	/			X	X	X	X	X	X	X	X
		Visual	X	X	X	X	X	X	X	X	X	X	X
		Self-Pacing	X	X	/	/	X	X	X	X	/	/	/
		Random Access	X	/		X	X	X	X	X			
	PRODUCTION	Editability	X	/	/	/	X	X	X	/	X	X	X
		Transportability	/	/	/	/	X	X	X	/	X	X	X
		Simplicity		/			/	X	/		X	X	X
		Low Cost					X	X	/	/	X	X	X
		Short Time Requirement	/				X	X	/		/	X	X
Media Attributes	DISTRIBUTION	Editability	X		X	X	X	X	/	X	X	/	X
		Self-Contained	X		X	X	X	X	/	X	X	/	X
		Scheduling		X	X	X	X	X	X	X	X	X	X
		Flexibility											
		General		/	/	/	X	X	X	X	X	X	X
		Availability					X	/	X	X	X	/	X
		Ease of Use	X		X		X	/	X	X	X	/	X
		Low Cost					/	X	X	X	X	/	X
		Quick Set-up Time	/		X		X	/	X	X	X	X	X
		No Special Environment	/	X	/		X	/	X	X	X	X	X
		Grouping Flexibility	/	/	/	/	/	X	X	X	X	X	X
		Compactness Handling/Storage		/	X	/	/	/	X	/	X	/	/

X = Is usually present in the medium
 / = Can be obtained, but is not a usual attribute of the medium
 • = Is usually not associated with the medium

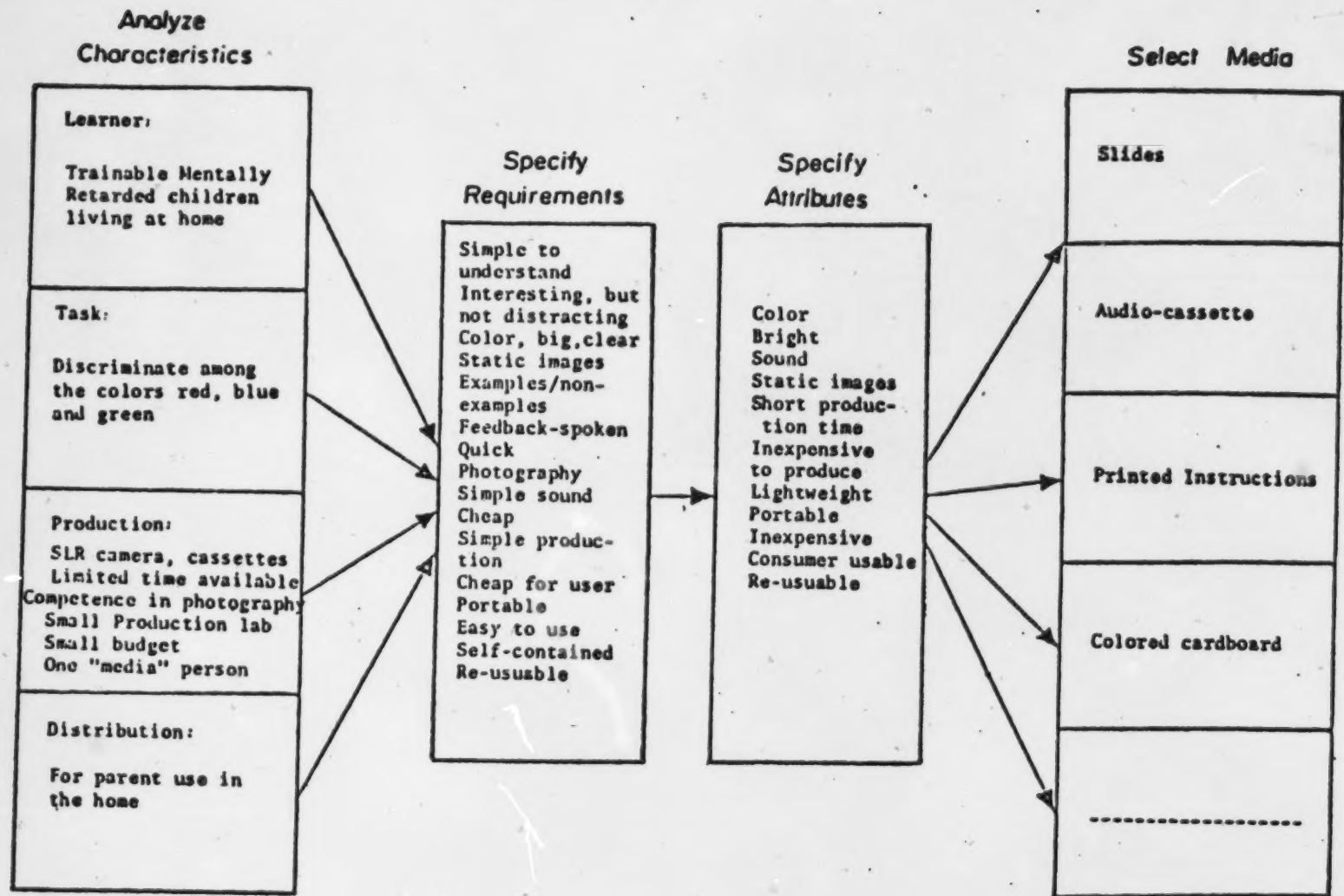


Figure 21

A Conventional Media Selection Strategy

An Alternative Approach to Media Selection

In recent years many educational technologists and instructional developers have begun considering the media selection problem from an alternative point of view. This approach, which has been labeled the "inverted approach" by Stolovitch and Thiagarajan (1975), begins with the identification of a suitable media combination with maximum number of attributes for minimum cost. The rationale for such an approach is that for all practical purposes any media combination is as good as any other in terms of instructional effectiveness. This belief, based upon decades of "no-significant-difference" results in media comparison studies (e.g., Chu & Schramm, 1967; Schramm, 1964; Silberman, 1962) is perhaps best expressed by Gagné (1970) thus:

Most media of communication can readily perform most instructional functions. They can be performed by pictures, by printed language, by auditory language, or by a combination of media. So far as learning is concerned, the medium is not the message. No single medium possesses properties which are uniquely adopted to perform one or a combination of instructional functions. Instead they all perform some of these functions well, and some not so well.

Wyman (1973; 1974) and Eachus (1972) have given some suggestions for the ideal media combination. However, their suggestions deal with future hardware configurations and these authors are among the first to concede the low probability of different manufacturers agreeing on a single configuration. In examining our media/media attributes table (Table 6), it is apparent that the combination of print, audiocassettes

and filmstrip possesses all desirable media attributes except motion and three dimensionality. For most educational and training purposes other than those in the specialized manipulative domain, the loss of these two attributes is not critical. This particular media combination has the major advantages of low cost and simple production. In addition, inexpensive hardware systems for synchronized sound/filmstrip projectors have simplified individual, small-group, and large-group use. Hence the media combination of synchronized sound filmstrip response book emerges as an optimal instructional vehicle.

This inverted approach to media selection does not nullify the principles of matching task and learner characteristics with media attributes. The focus, however, shifts from media selection to media allocation. The instructional developer now chooses the optimum component of the media combination for each instructional objective. This procedure makes instructional development more efficient. In addition, there are a number of secondary benefits:

1. The inverted model enables the developer to specialize in specific media. In an age where the technical sophistication of production is becoming increasingly complex, this provides a great advantage in selecting and training media specialists.
2. New and creative techniques can also be evolved through concentration on selected media.
3. Media production facilities can be expanded in an orderly fashion building upon existing resources rather than "tooling up" from scratch in a new medium for each new project.

4. The consumer does not have to keep pace with each new media combination. Thus an enormous savings in the equipment budget and the retraining of the learner on the use of the equipment is achieved.

Adapting the 4-D Model

An additional advantage of preselecting the media combination is that it permits us to provide more specificity to instructional development models. As pointed out earlier, all instructional development models provide skimpy details of the production procedure in the design stage. The reason for this is the impossibility of accommodating different media production procedures with a single set of guidelines. The 4-D model, which has been selected earlier for this study suffers from this weakness. However, if we prespecify the media combination of synchronized audiocassette, filmstrip and print, it is possible to adapt the model to include specific procedural details for production. Such an adaptation of the 4-D model is discussed in detail in Chapter IV.

Summary

This chapter selectively examined two bodies of literature, one on instructional development models and the other on strategies for media selection in order to identify an instructional development model suitable for adaptation for use with a specific media combination. The 4-D model (Thiagarajan, Semmel and Semmel, 1974) was identified as the appropriate one for adaptation for use with the media combination of print, audio-cassette and filmstrip.

Chapter III

HYPOTHESES

From the review of the literature on instructional development models in Chapter II, the 4-D model was identified as the most appropriate one for this study. The review of media selection strategies identified the combination of audiocassette, print and filmstrip as having a number of attributes most suited for instructional materials where physical manipulation is not part of the required competency. (Instructional materials produced in this particular media combination will be referred to as audiovisual training modules in the subsequent discussions.)

The problem stated in Chapter I:

Can a generalized instructional development model be adapted for the production of nonprint instructional materials?

can be more precisely restated as a hypothesis:

Hypothesis 1: An adaptation of the 4-D model can be applied to produce audiovisual training modules.

To this end, adaptations must be made on the 4-D model and instructional materials developed to test its applicability. Successful completion of at least two audiovisual training modules developed by consistently following the steps of the revised 4-D model can be considered as confirmation of this hypothesis.

Subsumed under the problem stated in Chapter I was a second question:

Does the nonprint instructional material produced through the application of the adapted instructional development model result in demonstrable learning?

This requires a comprehensive evaluation of the modules produced following the revised 4-D model and leads to the second hypothesis.

Hypothesis 2: Working through an audiovisual training module enables learners to attain the competencies prespecified in the objectives of the module.

The purpose of an instructional module is to help learners attain competencies they do not possess or to improve their level of proficiency in these competencies if they already have them to a limited degree. It is therefore reasonable to expect that learners who work through an audiovisual training module will exhibit a higher level of competence than those who do not experience the module.

Hypothesis 3: Pretesting on the content of an audiovisual training module does not affect attainment of competencies prespecified in the objectives of the module.

The effect of pretesting on posttest performance following self-instruction has long been a subject of study (e.g., Distad, 1927; Samuels, 1969). Hartley (1971) cites Holmes (1931), Kellogg & Payne (1938), Lumsdaine (1963), McKeachie & Hiler (1954, Warr, Baird, & Rackam (1970), and Washburne (1929) as having demonstrated

in both industrial and educational contexts . . . that not only can doing a pretest increase scores obtained on the same or similar questions asked in the post-test, but also that scores on post-test questions not given in the pretest are, sometimes, increased (p. 1).

From a series of six experiments of his own with a variety of learners, Hartley (1971) has found that

where instruction is efficient--where all students learn to criterion--then the effects of doing a pretest on post-test performance are unlikely to manifest themselves (p. 11).

Assuming the efficiency of the audiovisual training modules and a learning to criterion stressed by the specification of behaviorally-defined criteria, it is expected that pretesting of learners will have no significant effect on attainment of prespecified competencies.

Hypothesis 4: Competencies attained from working through an audiovisual module are maintained over time.

An important aspect of competency acquisition is retention, particularly since learners are not often given immediate opportunities to apply acquired competencies. Audiovisual training modules which provide "ample practice for skill development" (Peck & Tucker, 1971) should result in the competencies being retained over a period of several weeks.

Hypothesis 5: Previous experience and background of subjects do not affect the attainment of competencies prespecified in the objectives of the module.

In keeping with Hartley's findings (1971) vis-à-vis pretesting and efficiency of an instructional material, it is to be expected that the more efficient the material, the less effect background and experience have upon mastery performance. It is anticipated that the various analyses conducted prior to the design of an audiovisual module take into account

varying learner entry behaviors and that instruction leading to criterion is efficient. On this basis individual backgrounds and appearances should not affect attainment of prespecified competencies.

Hypothesis 6: Attitudes of learners who have worked through an audiovisual module are more positive toward the content of the module than attitudes of learners who have not.

An important aspect of learning is the development of a favorable attitude toward what is being learned (e.g., Mager, 1968). In addition to competency gains, well-developed instructional materials should also promote more positive attitudes toward the content of these materials. It is to be expected that audiovisual modules which have been produced according to the revised 4-D model will succeed in increasing favorable attitudes toward the content of the modules.

Hypothesis 7: Attitude toward the audiovisual module format changes positively as a result of working through such modules.

Thiagarajan, Semmel and Semmel (1974) state that mediated, modular self-instructional materials offer motivating and efficient alternatives to the lock-step, "lecture, recitation and practicum courses" traditionally offered in most educational institutions (p. 3). The audiovisual format offers media attributes which should appeal to the learner (e.g., sound, visuals, color, a degree of realism, immediate feedback, ease of use, extreme portability, a permanent record of the experience). Hence, the attitudes of learners utilizing modules are expected to become more positive.

Summary

The hypotheses put forth in this Chapter can be divided into two distinct groups: Hypothesis 1 requires confirmation through actual application of the revised 4-D Model to the production of audiovisual training modules; Hypotheses 2-7 are concerned with the effect of these modules upon acquisition of competencies. Chapter IV outlines the application of the model while Chapter V deals with the evaluative procedure.

Chapter IV

APPLYING THE MODEL TO THE PRODUCTION OF MODULES

This chapter outlines the procedure related to the confirmation of the first hypothesis viz., the adaptation and application of the 4-D Model to the production of audiovisual training modules. The chapter is divided into three major sections. The first section outlines the adapted 4-D model; the second and third sections describe the application of this adapted model to the production of two audiovisual training modules on parent-tutoring and instructional games respectively.

Adapting the 4-D Model

Chapter II identified the 4-D Model (Figure 22) as being particularly suited for the purposes of this study. The same chapter also identified the optimal audiovisual media combination of audiocassette, print, and filmstrip. This section describes an adaptation of the 4-D model (Figure 23) which is revised to accomodate the requirements of this specific media combination.

A summary of the major adaptations may prove useful before specifying the detailed steps. No changes were required in the Define stage of the original 4-D Model. In the Design stage, the media and format selection steps were eliminated because we are now using the preselected media format of the audiovisual training module. A new step of media allocation was created to deal with the distribution of the instructional content to the three components (audiocassette, print, and filmstrip) of the module. The step of expert appraisal was subdivided into three parallel steps dealing with each of the three components. An additional step of

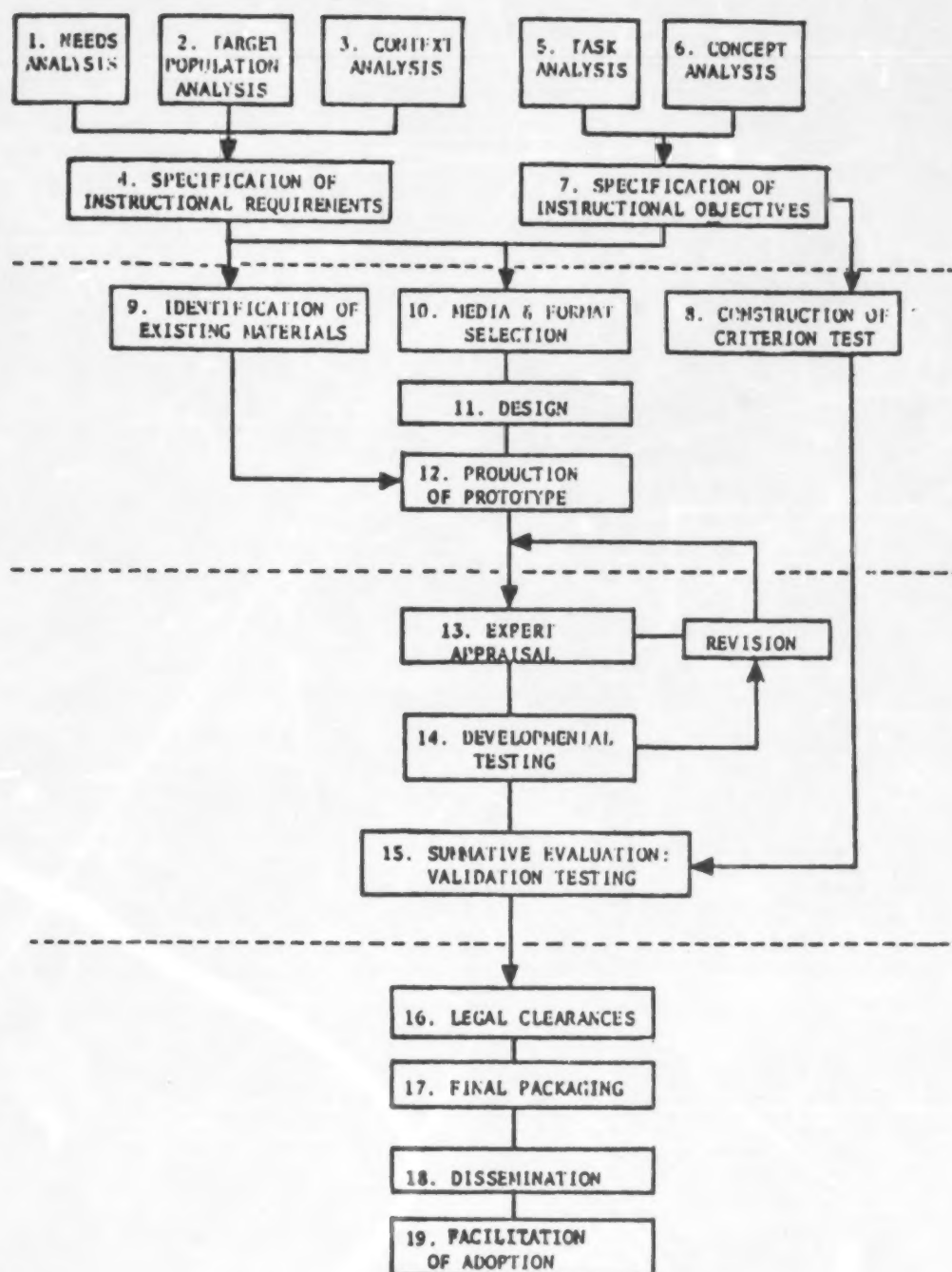


Figure 22

4-D Model

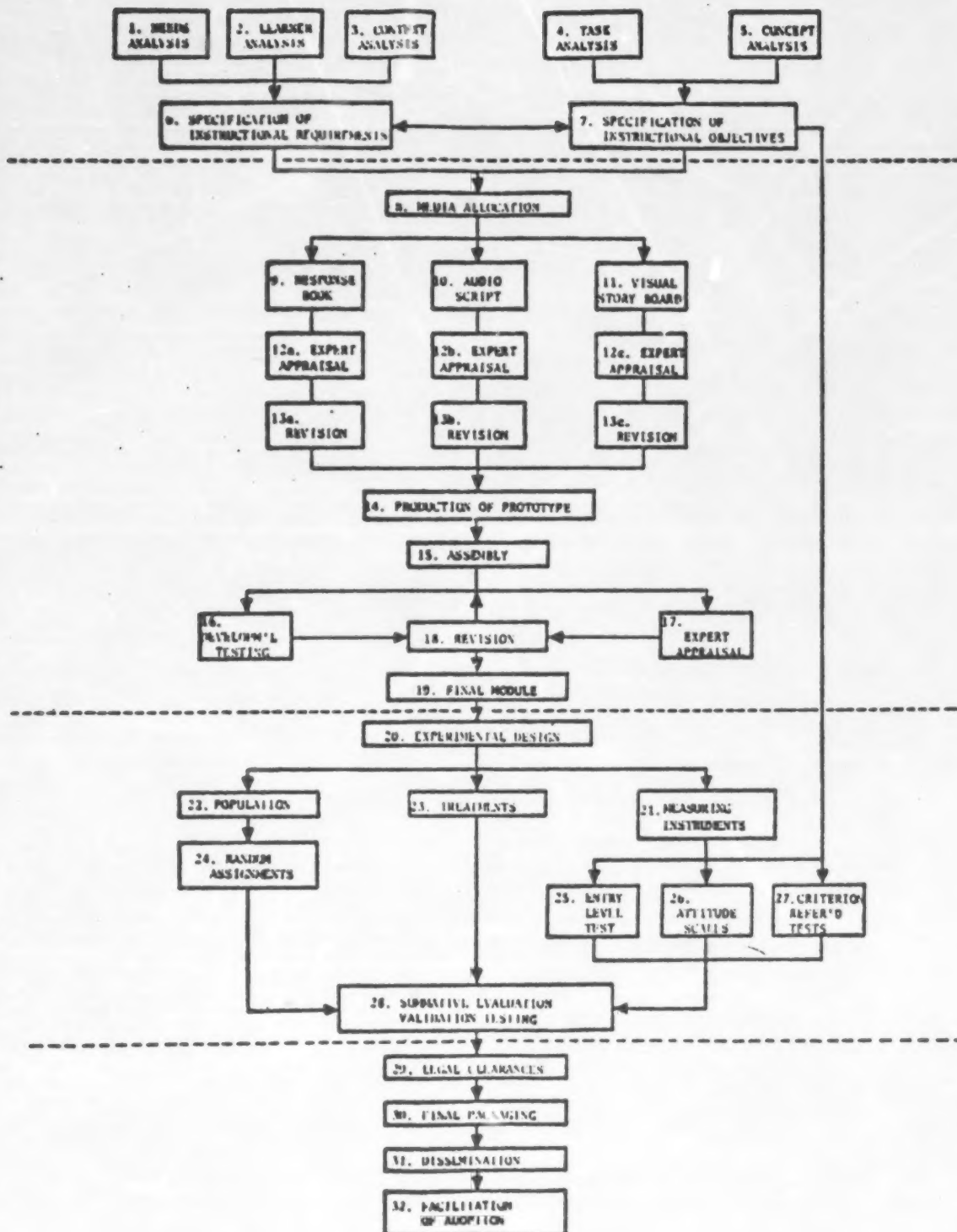


Figure 23

Adapted 4-D model

my my
7/1

prototype assembly was included in the revised model to terminate the Design stage. In the Develop stage, the steps of the original 4-D Model were retained, except that the expert-appraisal step was made more specific with references to the three media components. The revised 4-D model also includes detailed guidelines for summative evaluation. The experimental design, sampling techniques, treatments, and instruments are described in more detail than in the generalized model. No changes were made in the final Diffuse stage.

A detailed description of each step of the revised 4-D model is given below.

Analysis Stage

This stage is concerned with identifying the different factors which influence the design and development of the instructional modules. During this stage, a systematic needs analysis is carried out to find the most appropriate topic for each module. Based on this topic, learner, context, task and concept analyses are conducted to derive a set of instructional requirements consistent with the needs, environmental factors, and learner characteristics and a set of behavioral objectives based on the structure of the tasks and concepts.

Needs analysis. An audiovisual training module should not be the result of the developer's hunches as to what is needed, or an extension of what has been done previously. A systematic analysis should precede the production so that real problems are identified and arranged in an order of priority. During this step symptoms of the problem are identified to clarify in specific terms its characteristics and effects. As

the problem is diagnosed, underlying causes are uncovered to identify alternative solutions.

Learner analysis. This analysis examines who is to be involved in the problem solution. Audiovisual training modules which are produced by a developer without a careful consideration of the characteristics of the learner are usually ineffective (Gordon, 1970). Content, presentation form, language level, and approach must all vary with the type of audience utilizing the module. Learner analysis specifies this audience and identifies those characteristics which are likely to interact with the design of instruction. In this step the developer constructs questionnaires to test the learner's entry level knowledge, skills and experience. Suitable scales are also administered to test the learner's attitudes toward the content and the audiovisual format. A survey to determine language, style and media preferences are also undertaken in this step.

Context analysis. The appropriateness of an audiovisual training module varies with the situation in which it is implemented. An analysis is conducted to discover in what situations (e.g., workshops and correspondence courses) the module is to be used. This analysis looks at the variety of physical surroundings for utilization in order to ensure maximum flexibility for the module.

Specification of instructional requirements. The needs analysis uncovers a priority in the field that can be dealt with by using an audiovisual training module. The learner analysis examines the target audience; the context analysis establishes the situations in which the module is

used. From these analyses, specifications for the module are made. These specifications state what must be done, for whom, and using what approach. It also identifies constraints in time, cost, and resources.

Task analysis. This step examines the instructional topic in terms of the information, skills and knowledge the learner must acquire. Each major element of the content is broken into its component parts. The main task is analyzed into subtasks, each of which is further analyzed until the trainees' entry level is reached. Each subtask is examined and superfluous and trivial ones are eliminated.

Concept analysis. In addition to the skills and strategies to be acquired by the trainees, there are a number of fundamental concepts which have to be mastered. The instructional content is analyzed for its conceptual frameworks. Each concept is isolated and its critical and irrelevant attributes are identified. Examples and non-examples of these concepts are generated for use in teaching and testing.

Specification of instructional objectives. Just as the context and learner analyses provide the foundation upon which instructional requirements are specified, so the task and concept analyses provide the underlying framework for the instructional objectives. These objectives, expressed in behavioral terms, state clearly and unambiguously what the learner achieves through use of the audiovisual training module. These objectives inform the trainees what they can expect from the module. For the designer the objectives form the base for the design of the instruction and the construction of criterion-referenced tests.

Design Stage

The specification of instructional requirements and objectives signal the start of the next stage in the revised 4-D model. This stage is labeled the Design stage and involves the steps of media allocation, preparing initial blueprints for the print, audiocassette and filmstrip components, making preliminary revisions, producing each component, and assembling the entire audiovisual training module in its prototype form. Specific details of each step in this stage are given below.

Media allocation. In the revised 4-D model the media components are preselected. The audiovisual training module consists of three major components: a printed booklet, an audiocassette and a filmstrip. The instructional content is systematically distributed to the appropriate component.

Response book. The instructional objectives serve as the base from which criterion-referenced test items are developed. For each objective, an item is written to become the reference point toward which instruction is directed. The printed booklet, called the response book contains these criterion items. As trainees proceed through the module, they are required to respond to items. Thus the response book acts as a measure of attainment for each objective and provides the learner with a blueprint for a plan of action geared specifically to his/her situation. Upon completion of the module the learner retains the response book as a permanent and personalized reference. In addition to the learner's own responses, important guidelines, information, checklists, and references are included in the response book.

After the items in the response book are properly sequenced, it is evaluated by different experts. Subject-matter experts examine the response book for accuracy and relevance. Instructional development experts check to see if the objectives are correctly and logically formulated and if the criterion items are valid. A language editor reviews the appropriateness of the language and corrects any errors. From these evaluations a revised response book emerges.

Script. The script for the audiotape, including the cast of characters, narrative, dialogue, and music, is the main teaching component of the module. A storyline, with easily identifiable characters, is created for the script which teaches toward each criterion item of the response book. The narration also provides explanations and direction for other learning activities.

As with the response book, the script goes through repeated evaluation. Subject-matter experts examine it to ensure that the message is carried effectively to the learners. Principles, generalizations, and good examples receive particular scrutiny. In addition, instructional development experts study the script for consistency with the objectives, production experts verify the script for audio quality, and language editors tighten the language. As the script approaches recording, narrators review the script for word changes, emphasis and timing. These evaluations result in a prototype script ready for recording.

Visual storyboard. Just as the script evolves from the criterion items in the response book, the visual storyboard develops as the script is written. The visual component of the audiovisual training module

serves three functions:

- 1) It motivates the learner and maintains his interest level.
- 2) It provides visual messages which enhance the audio portion.
- 3) It acts as a focuser of attention.

The visual storyboard is designed parallel to the script, sometimes following from the words of the script, sometimes generating narrative. The visuals in the storyboard are divided into three major categories:

- 1) Live photographs of the characters in action.
- 2) Photographs of materials or objects.
- 3) Graphics including artwork and lettering.

Once the visual storyboard is complete, rough sketches and the script are submitted for evaluation to production experts.

Prototype production. When all three major components of the audio-visual training module have been sufficiently revised they are produced in a prototype form. The response book is typed in its final form. The script is duplicated in the format required for audio production and distributed to narrators. Rehearsals are held for the audio taping session. The script is recorded and edited. The visuals are produced in a series of sessions. Live shots are photographed on location and graphics are photographed on a copy stand. The end result is a prototype module consisting of an audiotape, a series of slides and a response book.

Assembly. When all components have been produced, assembly takes place. At this stage, the final selection of visuals is made. The response book is duplicated and bound, and the audiocassette is synchronized

with the slides. The entire package is checked for internal inconsistency, errors and omissions. Duplicate copies of all components are made and the prototype module is then submitted for developmental testing.

Developmental testing. Once the prototype audiovisual training module is assembled, it is tested on individuals and groups from the target population. These learners are observed and tested both during and after using the module. The aim at this stage is not to see how well the learners have learned, but to identify those parts which they find difficult, irrelevant, and confusing. Testing sessions of this nature with individuals or small groups provide extremely valuable feedback for final revisions.

Expert appraisal. At the same time as developmental testing is being conducted, experts from the subject-matter area and instructional technology are asked to review the prototype materials. Their appraisal is focused through various checklists and their comments are collected for future revision.

Revision. As feedback data from developmental testing and expert appraisal come in, revisions are made in the module. The cycle of testing and revision is repeated until learner performance and expert comments appear consistently satisfactory. The total package is now prepared for final production.

Final production. The final audiovisual training module incorporates all revisions on the basis of developmental testing and expert appraisal. The response book is typeset and printed in its final form. The slides

are converted to a filmstrip. The audiocassette is edited and duplicated. The total module is assembled and made ready for the field.

Evaluation and Diffusion Stages

After the final production and assembly, the audiovisual training module is subjected to an extensive summative evaluation. This stage is described in detail in the next chapter. The final stage of diffusion follows the procedures described in the original 4-D Model. Since it is beyond the scope of this study, it is not described in this report.

Production of an Audiovisual Training Module on Parent Tutoring

This section describes the salient points in the application of the revised 4-D Model to the production of an audiovisual training module on parent-tutoring. The description of this production activity parallels the preceding description of the revised 4-D Model. Activities during each step of the developmental procedure are briefly described below.

Needs analysis. Semmel and Thiagarajan (1972) conducted a needs analysis to identify high priority training areas for preservice and inservice teachers of handicapped children. On the basis of this needs assessment, the following problem areas were identified:

How can volunteers be used effectively in the classroom?

How can parents be trained as tutors of their own handicapped children?

How can classroom teachers systematically observe and record an exceptional child's behavior?

How can teachers informally assess a handicapped child's reading level?

How can teachers use instructional games with handicapped children?

How can teachers make their own materials for use with handicapped children?

How can teachers apply systematic decision-making strategies for teaching the individual handicapped child?

How can teachers effectively use charts in classrooms for handicapped children?

How can more effective questioning techniques be applied with handicapped learners?

The topic of parent-tutoring was selected as the first application of the revised 4-D Model to the production of an audiovisual training module. This choice was based on an urgent need for increased use of parent-tutors. The following is a summary of the main issues extracted from the needs assessment:

Although it appears natural that parents should be interested in helping their children with their school work, parents' willingness to spend time and effort has only recently been systematically measured. In a nationwide survey of the public's attitude toward schools, Gallup (1971) reported that 54 percent of the adults interviewed place the chief blame for children's poor academic performance on their home life. The following question was used to collect follow-up opinion:

A suggestion has been made that parents of school children attend one evening class a month to find out what they can do at home to

improve their children's behavior and increase their interest in school work. Is it a good idea or a poor idea? (Gallup, 1971, p. 38).

Eight out of ten of all adult parents of school children said it was a good idea. According to Gallup's interpretation, "this very impressive percentage reveals a growing recognition of the role of parents in the educational process, and the need for a new kind of partnership between teachers and parents" (Gallup, 1971, p. 39). Gallup also observes, "Preparing parents to carry out their educational responsibilities is just as important as training teachers. . . ." (Gallup, 1971, p. 39).

Although there is no indication of the proportion of parents of handicapped children in this survey, other surveys and studies indicate that parents of educationally disadvantaged children share these feelings and this willingness. These parents reportedly have very high educational aspirations for their children (Bell, 1965; Katz, 1968). It is clear that there is a willing pool of parents ready and eager to participate in the education of their handicapped children.

Many of these parents are frustrated by their lack of skills in tutoring children. Deutsch (1966) speculates that because nobody explains to parents how they can help their children, the children continue to experience unnecessary failure. Katz (1968) reflects the same feeling and reports that many parents who have high aspirations for their children lack the necessary tutoring skills. Pines (1966) recommends that parents of educationally disadvantaged children should become partners with teachers in educating their children.

There are a number of simplified tutoring techniques which have been successfully taught to parents (Champagne & Goldman, 1972; Niedermyer, 1969; Reavis, 1973). Studies (e.g., Bushell and Jacobson, 1968) indicate that parents of lower socioeconomic status can quickly master and apply various strategies for tutoring children. Goldman (1970) reports the successful training of seven mothers on such tutoring skills as increased use of reinforcers and decreased use of negative comments. The training lasted from five to eight weeks and parent-tutors acquired and applied their skills with remarkable versatility.

Parent tutoring results in achievement gains by children. Reavis (1973) reports gains in arithmetic by children whose parents tutored them using a special type of materials called acceleration sheets. Mothers who received training in tutoring from a teacher were able to help increase their child's mean Binet I.Q. scores to a significant degree (Karnes, Stadley, & Wright, 1966).

Alan Hofmeister and his associates (1972) at Utah State University have produced a number of tutoring packages for use by parents of handicapped children. Similar packages are being developed at other institutions and commercial organizations. Although these packages are extremely effective, they still need a classroom teacher to deliver them to the parents and to monitor their use. As Hofmeister (1975) points out, "Concerned parents represent a valuable resource if a way can be found to effectively involve them in the remedial process" (p. 1). He concludes that, "In the presence of so many handicapped children, the educator cannot afford to overlook any resource, let alone one with such a manpower potential" (pp. 5-6).

A computerized search to discover training materials on the use of parent-tutors as teachers of the handicapped failed to turn up any titles. A further search of the resources at the National Center for Educational Materials at Ohio State University and among the catalogues on Resources for Performance Based Education (Houston, 1973) also revealed no available materials on the preparation of parent-tutors by classroom teachers. Hence the need for a training package on parent-tutoring was strongly established.

Learner analysis. The target population for the parent-tutoring module was identified as preservice and inservice teachers of handicapped children. The term "handicapped children" in this context refers to children who are mildly mentally retarded, learning disabled, or emotionally disturbed. The "teachers" refer to trainees in special education, student teachers, teachers in special education classes, consulting teachers, and regular-class teachers with handicapped children mainstreamed in their classrooms.

To analyze the characteristics of this group of trainees, a checklist (Thiagarajan et al., 1974) was used. This checklist is reproduced in Appendix A. The results of the learner analysis are shown in Appendix B.

Context analysis. To determine the conditions and constraints under which the parent-tutoring module would be used, a context analysis checklist was employed. This checklist is shown in Appendix C. The results of the context analysis are shown in Appendix D.

Specification of instructional requirements. Based on the needs, learner, and context analyses, a set of instructional requirements for the parent-tutoring module were specified. Appendix E contains these specifications.

Task analysis. From interviews with subject-matter experts, instructional developers, special education teachers and a study of the available literature on the use of parent-tutors, a task analysis was performed. Appendix F presents the final task analysis in graphic form.

Concept analysis. The following major concepts were identified as critical for the mastery of parent-tutoring procedures:

1. handicapped child
2. tutoring
3. parent-tutor
4. programmed tutoring by parents
5. parent-teacher conference
6. training session
7. objectives
8. instructional resources
9. exceptional parent
10. reward systems

A formal concept analysis was conducted on programmed tutoring by parents as it was the only one outside the repertoire of the trainees. Results of this analysis are shown in Appendix G.

Specification of instructional objectives. On the basis of both task and concept analyses a set of instructional objectives for the module on

parent-tutoring were derived. These are contained in Appendix H.

Design Stage

Once all the analyses were completed and the instructional requirements and objectives specified, the design and production of the actual audiovisual module began. The activities in this stage are described below.

Media Allocation

The pre-selected audiovisual media combination consisted of a response book, audiocassette and filmstrip. Once the objectives and requirements were specified, allocation of the instructional message to these different media components took place. Following the rationale employed in the revised 4-D Model, each component was designed to carry that part of instruction for which it was best suited.

Response Book

The response book for the module Parents As Partners in Teaching Handicapped Children provided the following four major items:

1. The objectives of the module.
2. Criterion-referenced test items which matched these objectives.
3. A permanent record of the trainees' responses and hence a blueprint for establishing a parent-tutoring program.
4. Useful hints and follow-up readings.

The criterion-referenced items were developed from the objectives. As the script for the audiocassette was developed, these items were

adapted to the storyline. Appendix I shows the first objective of the module and the matching criterion item as it evolved to its final form in the response book.

Script

The audio script of the module Parents as Partners in Teaching Handicapped Children follows two young teachers in their efforts to initiate a parent-tutoring program. Through narration and dialogue in an elementary school setting, trainees vicariously share the experiences of these teachers. The script leads the trainees toward each criterion item of the response book. They are then required to respond actively with reference to their own personal experiences. The script provides feedback to the trainees allowing them to evaluate their own responses.

Visual Storyboard

As the script evolved, so did the visual storyboard for the module. In the design of the visuals, attention was paid to various principles of perception (Fleming, 1969) and to careful integration of the visuals with the audio script. The visual storyboard received repeated evaluations from subject-matter experts and technical specialists.

Expert Appraisal

The module Parents As Partners in Teaching Handicapped Children was submitted for repeated appraisal by experts. The review panel included:

1. Special education faculty members at the Center for Innovation in Teaching the Handicapped, Indiana University.
2. Instructional developers at the Center for Innovation in Teaching the Handicapped and in the Instructional Systems Technology Department, Indiana University.
3. A professional editor.

Revision

Based on feedback from these experts, a number of revisions were carried out. Some examples of major revisions are given below:

1. The script was considerably shortened.
2. Cartoon illustrations were dropped from the module and replaced by live shots and graphics.
3. A discussion of the "exceptional" parent (e.g., the single parent, the parent of many children, the unemployed parent) was included at the end of the module.

Production of Prototype

A prototype of the module Parents as Partners in Teaching Handicapped Children was produced over a two-month period. Students and two faculty members of the theater department at Indiana University recorded the audio script in three one-and-a-half hour sessions. All visuals were

shot as 35mm double frame slides. The Developmental Training Center at Indiana University provided handicapped children, classroom settings, and parent-tutoring materials. All captions were typed on cardboard with an IBM Selectric typewriter and photographed on Ektachrome indoor film. The response book was typed on mimeograph stencils and duplicated on 8½ x 11" paper.

Assembly

When the editing of the audiotape was completed, it was subaudibly pulsed with subaudible tones for synchronization with the slides. The entire module was prepared for expert appraisal and revision.

Developmental Testing

During this phase, trainees enrolled in courses in the School of Education at Indiana University were exposed to the module Parents As Partners in Teaching Handicapped Children. This developmental testing was divided into three major stages. The situation, type of students, type of data sought, type of revisions made and number of sessions conducted at each stage are summarized in Table 7 which follows very closely the suggestions made by Thiagarajan et al. (1974, p. 138).

Expert appraisal. At the same time as developmental testing was taking place, experts were asked to critically appraise the prototype module. Checklists such as those shown in Appendixes J, K, L and M were used to focus the experts in their evaluation.

In addition to special educators, production experts were asked to assess the technical quality of the mediated components. Faculty

Table 7
Developmental Testing Stages

Stages	Tryout situation	Type of students	Type of data	Revision	Number of sessions
1. Initial testing	Individual teacher trainees or small groups in a face-to-face situation with the instructional developer	Selected teacher trainees	Qualitative. Responses, reactions, and comments from teacher trainees	Some on the spot, others after each tryout session	Five
2. Quantitative testing	In actual training situation under the direction of the instructional developer	Teacher trainees enrolled in a course	Written responses. Also responses to questionnaires	Systematic revisions based on data analysis	Two
3. Total-package testing	In actual training situations without the instructional developer	All teacher trainees enrolled in a course	Responses to tests and questionnaires. Instructor comments and suggestions	Revisions of instructor's manual and adjunct materials	Two

and graduate students of the Division of Instructional Systems Technology at Indiana University were individually approached for their appraisal of the prototype. Two graduate classes in advanced production techniques also evaluated the prototype module. Checklists such as those found in Appendixes N, O, and P were employed to aid in the expert technical appraisals.

Revision

Expert appraisal, developmental testing, and revision were virtually simultaneous activities over a one month period. Revised versions were resubmitted to new students and experts for cross validation. A summary of revisions conducted during this phase is given below:

Audiotape: 1. All sections containing Mr. Roloff, the principal, were entirely re-recorded because of poor audiorecording quality.

2. The length of the theme music at the beginning of the tape was shortened.

3. The introduction was shortened.

4. Pauses between scenes were lengthened.

5. Four minor sections were deleted.

6. A musical break for an exercise in the response book was inserted.

Visuals: 1. Captions were redone using transfer letters. They were then photographed on 35mm Kodalith high contrast film and finally hand-dyed.

2. Close-up shots showing facial expressions were included.

3. Four visuals were added to the storyboard to enhance clarity.

- Response Book. 1. The format was changed from 8 1/2 x 11" to a 6 x 9" horizontal style to increase ease of handling.
2. Plastic binding replaced staples to make the response book more usable.
3. The criterion-referenced item on writing a letter to the parent was rewritten and a checklist was provided for evaluation.
4. Suggestions for parent-conference goals were expanded.
5. The list of topics for group discussion was expanded.

Final Production

Once the module began eliciting favorable comments and consistent student performance, final production was initiated. The slides were converted to filmstrip. The recording on audiotape was transferred to audiocassette. Synchronization of the audio to the filmstrip was checked. The response book was printed by offset. Finally, a package to contain all the components of the module was designed and produced. The result was the final version of the module Parents As Partners in Teaching Handicapped Children, ready for field evaluation.

Production of an Audiovisual Training Module on Instructional Games for the Handicapped

This section describes the application of the adapted 4-D Model to the development of another audiovisual training module on instructional games for handicapped children. The developmental activity was carried out by an independent instructional developer to cross-check the applicability of the adapted model.

Needs Analysis

The topic of instructional games for handicapped children was among the ones identified through the earlier needs analysis conducted under the direction of Semmel and Thiagarajan (1972). The specific rationale for the choice of instructional games as a classroom tool is given below:

The use of instructional games in special education goes further back in history than their use in regular education. With a few exceptions (e.g., Fink et al., 1971), very little empirical evidence exists on the effectiveness of these games. However, teachers' experiences and logical analysis suggest that instructional games have an important role in the teaching of handicapped children. A few of the salient advantages of using games with handicapped children are presented below:

Games and communication skills. Many handicapped learners lack verbal fluency and are unnecessarily penalized for poor receptive and expressive communication skills. In games, where both stimuli and responses are very often nonverbal, success is seldom correlated with verbal ability. Many scholars believe that games mobilize intellectual competencies at the iconic rather than the symbolic level. Such games provide the handicapped learner with the ability to grasp a situation intuitively rather than analytically.

Games and instructional objectives. Games can enhance learning at different levels. The curriculum for the handicapped learner involves

a large number of lower-level cognitive objectives such as language patterns and number facts. Though essential, this learning is not exciting. Games can add spice to these dull didactic chores. Handicapped children also need to attain a number of higher-level cognitive objectives, and games are an effective means for achievement in this area. These learners cannot handle abstractions easily; a game could make such abstractions concrete and specific. Finally, games have been proven to be extremely successful in helping learners attain various desirable attitudinal objectives. Play of games is a useful activity for learners to explore the affective domain.

Games and instructional feedback. Handicapped children need more frequent and immediate feedback than their normal peers in acquiring new skills and concepts. In a game, such feedback is prompt and real. It is the natural consequence of the player's performance and is related to the ultimate outcomes of the game. In this way, the feedback is closer to its real-life counterpart than any other type of classroom feedback.

Games and socialization. Piaget (1962) and others have pointed out that game experiences are essential for the development of full interpersonal capabilities and capacities of children. Classroom games provide the handicapped learner with a general orientation toward social relations and a realistic perception of life rules. These games also require cooperation and agreement among the players for their success. Individualized instructional activities in the classroom often isolate the handicapped child. Instructional games compensate for this by

encouraging peer learning and cooperation.

Games and self-concept. Usually the labeled child has a poor concept of himself and hesitates to participate in the face of repeated failures in the classroom. Games free him to engage competitively in stimulating activities and to develop a healthy attitude toward both success and failure. As he ventures out through instructional games, the learner finds success through a combination of good luck and good judgment. This type of intermittent reinforcement keeps his learning performance at a high level and increases the number of his success experiences. There is room for more success in a game than in a lesson: an ingenious idea which might have passed unnoticed or misunderstood in a classroom discussion may make a dramatic difference in a game. The player feels that power of controlling his environment and enhances his image of self-efficacy.

Games and motivation. Many problems in teaching handicapped children are motivational, and instructional games contribute importantly in this area. With a variety of dramatic aspects, these games involve the learner to a degree unequalled by any other instructional activity. Learning from a game is unobtrusive; useful skills are developed at the exact time the learner needs them. Thus games provide a high degree of relevance to what is being learned by the handicapped child.

Other Steps in Analysis and Design of the Module

Many of the subsequent steps in the developmental procedure were identical or similar to those undertaken for the previous module because

the target population, instructional context, and the format were all identical. To avoid redundancy, no detailed description of the analysis and design procedures are provided.

Summary

This chapter described the procedure used for testing the first hypothesis on the applicability of the adapted 4-D Model. In the first section the adapted model was presented in its general terms. The application of the model to the actual development of two audiovisual training modules on parent-tutoring and instructional games were discussed in the remaining two sections. The completed modules underwent a summative evaluation. Details of the evaluative procedure are discussed in the next chapter.

Chapter V

EVALUATION OF THE MODULES

An extensive summative evaluation of the two modules on parent-tutoring and instructional games was carried out to test the remaining six hypotheses of this study. In this chapter, the general summative evaluation procedure is described first. Actual details of the field testing are given later.

Evaluation Procedure

To complete the discussion of the adapted 4-D Model begun in the previous chapter, a general discussion of the steps in the evaluation stage are given below.

Experimental design. An experimental design which possesses a number of advantages for the summative evaluation of pairs of audiovisual training modules is a modified posttest-only design which is referred to as the "cross-over" design (Figure 24). It is characterized by the random division into two groups of a representative sample of the target population. Two different modules are randomly assigned to each group. After working through the assigned module, subjects are given a criterion-referenced posttest on the content of both modules. After suitable elapse of time, subjects are assigned to the other module. Finally, the common criterion-referenced posttest is administered again to both groups.

First Testing			Second Testing	
Group A	Module I	Posttest on both modules	Module II	Posttest on both modules
Group B	Module II		Module I	

Fig. 24. Experimental Design

This particular experimental design offers some unique advantages over others:

1. The design ensures that instruction is not withheld from any subject.
2. The design provides initial exposure to a module without pre-test contamination.
3. The design eliminates wastage of subjects since all subjects receive both treatments.
4. In terms of the main evaluative hypothesis--Working through an audiovisual training module enables subjects to attain competencies prespecified in the objectives of the package--internal validity (Campbell & Stanley, 1963) is maintained since only the initial treatment plus posttest is involved in the first phase.

Group A	Module I	Posttest on both modules
Group B	Module II	

Specific details of the control of various threats to internal validity (Campbell & Stanley, 1963) are given below:

History--The single measurement eliminates confounding incidents which occur between a first and second measurement.

Maturation--The single treatment eliminates any possible maturational effects.

Testing--The single test eliminates the effects of taking it a second time.

Instrumentation--The same people score the tests according to prespecified criteria.

Statistical regression--Randomization procedures in assignment of subjects and treatments to groups minimize this threat.

Experimental mortality--A single testing session eliminates mortality of subjects.

Selection-maturation interaction--Random assignment of subjects to modules with one group acting as a control for the other, reduces the possibility of this type of extraneous variable.

External validity is also controlled in these specific ways:

1. Reactive or interaction effect of testing is avoided by eliminating pretesting.
2. Interaction effects of selection biases and experimental variables are diminished through randomized assignment of subjects and treatments to groups.
3. Multiple treatment interference is reduced by assigning a single module to each group.

The "cross-over" after a suitable delay permits additional questions to be answered, particularly those related to the delayed effects of the modules and of pretesting in a modified replication of the initial phase.

Measuring Instruments

Various measuring instruments are constructed to measure the effectiveness of the audiovisual training modules. A brief description of each of these instruments is given below:

Entry questionnaire. These questionnaires are designed to collect data on the subjects' backgrounds and experiences. These data permit the evaluator to obtain a clear picture of the type of trainee and to check if any factors in the trainees' background affects the attainment of the instructional objectives. The questionnaire also checks if trainees possess the prerequisite skills.

Specific information collected by the questionnaire include the learner's education level and experience with the task. Questions about previous experience with similar training modules and skills in handling the media equipment are also included in the questionnaire.

Attitude scales. Attitude scales are devised to test the attitudes of the trainees on two major dimensions: the content and the format of the module. The latter scale is administered prior to using the module to provide comparisons with post-attitude measures.

Criterion-referenced tests. Criterion-referenced tests are designed to check whether the relevant competencies are attained by working through the module. Each item on this test matches an objective of the module and requires the trainee to demonstrate competency he/she has acquired from the module. These criterion-referenced tests are primarily used for comparisons between those who have worked thorough a given module

and those who have not.

Sampling the population. While different measuring instruments are being constructed, plans for obtaining representative samples of the target population are also made. The selected subjects are introduced to the modules in as natural and normal a manner as possible and in actual field settings.

Administration. All subjects receive an audiovisual training module complete with appropriate equipment and supplies. The module is administered individually. Each subject works through the specific module given him/her. S/he responds in the book when instructed to do so by the tape. At the end of the module, s/he answers different tests and scales supplied by the monitor. This same administration procedure is repeated with the second module after a delay of several weeks.

Summative Evaluation of the Modules

In this section specific details of the actual field testing of the two modules--Parents as Partners in Teaching Handicapped Children and Instructional Games for Handicapped Children--are given. Having established the cross-over design as being the most suitable for the summative evaluation of the two modules, different measuring instruments were designed.

To test Hypotheses 2, 3 and 4, two criterion-referenced tests were developed, one on parent-tutoring and the other on instructional games. These tests are shown in Appendixes U and V respectively. All test items were compared with the appropriate objective of the module by using

Mager's (1973) formula. A panel of four judges was involved in this procedure to establish validity. Items which did not match the objective were rewritten until all judges were satisfied.

Since the emphasis of this evaluation was to measure "attainment of prespecified competencies", the criterion-referenced tests required trainees to demonstrate actual application. Thus the trainees were asked to write letters, prepare cue cards and design instructional games rather than recognize correct answers in an objective test. A storyline setting for each criterion-test was created to increase the realism of the testing situation. Criteria for scoring the response to each individual item were pre-established and objective scoring keys laid down.

An entry questionnaire to determine the experiences and the backgrounds of the subjects and to collect demographic information is shown in Appendix W. This questionnaire was used for testing Hypothesis 5.

To test Hypothesis 6 on attitudes toward the content of the two modules, suitable scales were developed using the Likert(1932) method on parent-tutoring and on instructional games (Appendix X and Y) .

To assess attitudes toward the format and hence test Hypothesis 7, a semantic differential (Osgood, Suci & Tannenbaum, 1957) on attitudes toward self-instructional materials was designed. This instrument is included in Appendix Z.

Subjects

Three field test sites were selected for the evaluation of the modules:

1. Georgia State University, Atlanta, Georgia.
2. University of North Carolina, Ashville, North Carolina.
3. Western Carolina University, Cullowhee, North Carolina.

These sites provided a wide range of target students in terms of a large city, a medium-sized town, and a rural area.

All subjects were enrolled in the special-education departments of the local institutions and had some experience with handicapped children. Subjects represented the categories of undergraduate special education students, student-teachers in special education, and inservice teachers. There was a total of 90 subjects, 22 from Georgia State University, 15 from the University of North Carolina, and 53 from Western Carolina University. Sixteen of these subjects were male and 74 were female. Ages ranged from 19 to 55. Table 8 summarizes relevant background information on the subjects. All subjects participated in the study as part of their normal course work.

Evaluation procedure. At each site, a large room was set up with individual audiovisual machines for 15 subjects. Singer-Graflex Auto-vance II audiocassette/filmstrip machines were used for presenting the module. The machines were loaded with either of the two modules. Response books were placed near the appropriate machine.

Subjects were asked to report to the study room during their usual class period. Upon arrival each subject was given the entry questionnaire and the attitude scale on self-instructional materials. A coin flip determined which treatment was to be assigned each group. As each subject completed the questionnaire, the random number table was consulted. Subjects with even numbers were given machines containing the parent-tutoring module and those with odd numbers, the instructional-games module. The monitor gave each subject instructions on how to operate the machine. The subject wrote his/her name and the starting time on the

Table 8

Frequency of Subjects in Terms of Age, Teaching Experience with
Handicapped Children, Level of Education,
and Number of Special Education Quarter Courses Taken
(N = 90 Subjects)

<u>Age</u>	<u>f</u>	<u>Age</u>	<u>f</u>
19-21	48	31-33	1
22-24	19	34-36	3
25-27	8	37-39	1
28-30	5	40+	5

<u>Teaching Experience</u>	<u>f</u>	<u>Teaching Experience</u>	<u>f</u>
None	49	3-5 years	2
Less than 1 year	29	6-10 years	2
1-2 years	8		

<u>Education Level</u>	<u>f</u>	<u>Education Level</u>	<u>f</u>
Freshman	2	Senior	40
Sophomore	2	Master's student	19
Junior	25	Master's degree	2

<u>Number of Special Education Courses Taken</u>	<u>f</u>	<u>Number of Special Education Courses Taken</u>	<u>f</u>
1	11	5	8
2	10	6-10	33
3	4	11-15	11
4	8	16-20	5

response book. As subjects worked through their modules, a monitor circulated to provide procedural help. As each subject completed his/her assigned module, the time was noted on the response book. S/he then took the book to the monitor who exchanged it for a set of tests which included the criterion-referenced tests on parent-tutoring and instructional games, and the Likert scales on the same two topics. These instruments were arranged in random sequence to avoid any order effect. After responding to them, the subjects turned the tests over to the monitor. This completed the first phase of the evaluation.

The second phase of the evaluation was administered three weeks after the first. The procedure during the second phase was identical to that during the first. As subjects arrived, they were given a machine with a module they had not worked through the first time. As subjects completed their modules, they noted the completion times, turned in their response books and received the same set of measuring instruments as before. Finally, subjects responded to the same semantic differential on self-instructional materials which they had received at the beginning of the first trial.

Scoring

Criterion-referenced tests were randomly mixed so that tests from both groups and for both trials were interspersed. An expert on games scored all test booklets on instructional games using an objective scoring key. Because of the length of the test on parent-tutoring, items were divided among four expert judges who scored the responses using the scoring keys. The attitude scales which required no judgments for

scoring, were randomly mixed together and scored by the clerical staff. After all test results were obtained, the sheets were matched back to the subjects and the data tabulated.

Summary

This chapter outlined the general procedures for the summative evaluation of audiovisual training modules in the first section. An appropriate experimental design was also identified and described. Measuring instruments, treatments and randomization procedures were specified. In the second section the application of this procedure to the actual summative evaluation of the two modules is described.

Chapter VI

RESULTS AND DISCUSSION

In this chapter each hypothesis stated in Chapter III is re-examined in terms of the product and data outcomes of the study.

An adaptation of the 4-D Model can be applied to produce audiovisual training modules.

The test of this hypothesis involves documenting logical adaptations of the 4-D Model to suit the media combination of audiocassette, print and filmstrip and then applying the adapted model to the actual production of audiovisual training modules. The necessary adaptations were done successfully and are described in the first section of Chapter IV. Two audiovisual training modules were produced by scrupulously following the specifications laid down in the adapted model. These modules were on two different topics and their production was carried out independently by two different developers. The completed modules in their final assembled form confirm the applicability of the adapted model in more than one situation.

Working through an audiovisual training module enables learners to attain the competencies prespecified in the objectives of the module.

To test this hypothesis, comparisons were made between the criterion-referenced tests scores of subjects who had worked through a particular module and those who had not. In Figure 25 which illustrates the sequence of treatment and testing procedures, Group A's test scores

	Trial I	Trial II
Group A (n=45)R	S ₁ X ₁ P AO ₁ AO ₂ AL ₁ AL ₂	X ₂ G AO ₃ AO ₄ AL ₃ AL ₄ S ₂
Group B (n=45)R	S ₁ X ₁ G BO ₁ BO ₂ BL ₁ BL ₂	X ₂ P BO ₃ BO ₄ BL ₃ BL ₄ S ₂

KEY:

R = Random assignment of subjects

Groups:

A = Subjects who worked through the parent-tutoring module during Trial I.

B = Subjects who worked through the instructional games module during Trial I.

Semantic differential on self-instructional format:

S₁ = Pretest

S₂ = Posttest

Instructional treatments:

X₁P = Parent-tutoring module during Trial I.

X₁G = Instructional games module during Trial I.

X₂P = Parent-tutoring module during Trial II.

X₂G = Instructional games module during Trial II.

Criterion-referenced tests:

AO₁ = Test on parent-tutoring (after parent-tutoring module--Trial I)

AO₂ = Test on instructional games (after parent-tutoring module--Trial I)

AO₃ = Test on parent-tutoring (after instructional games module--Trial II)

AO₄ = Test on instructional games (after instructional games module--Trial II)

BO₁ = Test on parent-tutoring (after instructional games module--Trial I)

BO₂ = Test on instructional games (after instructional games module--Trial I)

BO₃ = Test on parent-tutoring (after parent-tutoring module--Trial II)

BO₄ = Test on instructional games (after parent-tutoring module--Trial II)

Attitude scales:

AL₁ = Scale on parent-tutoring (after parent-tutoring module--Trial I)

AL₂ = Scale on instructional games (after parent-tutoring module--Trial I)

AL₃ = Scale on parent-tutoring (after instructional games module--Trial II)

AL₄ = Scale on instructional games (after instructional games module--Trial II)

BL₁ = Scale on parent-tutoring (after instructional games module--Trial I)

BL₂ = Scale on instructional games (after instructional games module--Trial I)

BL₃ = Scale on parent-tutoring (after parent-tutoring module--Trial II)

BL₄ = Scale on instructional games (after parent-tutoring module--Trial II)

Figure 25

Summary of Treatment and Testing Procedures

on parent-tutoring (AO_1), were compared with Group B's scores on the same topic (BO_1). Table 9 shows the means and standard deviations of scores for each administration of the criterion-referenced test on parent-tutoring by group (AO_1 , BO_1 , AO_3 , and BO_3). A comparison of these means was conducted using a two-factor repeated-measures analysis of variance. The results are summarized in Table 10. On the basis of the significant interaction effect between groups and test administrations, Scheffé multiple-comparison tests were carried out on the cell means. Those who worked through the parent-tutoring module scored significantly higher on the test on parent-tutoring than those who worked through the instructional games module ($p < .01$). In addition, a comparison of mean scores on the test on parent-tutoring for the group which first went through the instructional games module (BO_1) and then three weeks later worked through the parent-tutoring module (BO_3) again revealed a significant difference ($p < .01$). This latter comparison indicates significant gains between pre- and posttesting.

The same statistical procedures were employed to test the effects of the instructional games module. The means and standard deviations of scores obtained on the criterion-referenced test on instructional games (AO_2 , BO_2 , AO_4 , and BO_4) are shown in Table 11. The results of a two-factor repeated-measures analysis of variance on the scores for this test are shown in Table 12. A significant interaction effect between groups and test administration was revealed ($p < .01$). Scheffé's multiple-comparison test was applied to the cell means. The mean score for those who had worked through the instructional games module (BO_2) was significantly higher than the mean score of those who had not

Table 9
Means and Standard Deviations of Scores on the
Criterion-Referenced Test on Parent-Tutoring

	Test Administration I		Test Administration II	
	Mean	Standard Deviation	Mean	Standard Deviation
Group ^a				
A	41.69	6.70	37.33	8.30
B	21.69	10.32	40.04	9.21

^an = 45 for each group

Table 10
Two-Factor Repeated-Measures Analysis of Variance of
Scores on the Criterion-Referenced Test on Parent Tutoring

Source	df	MS	F
Groups	1	3362.69	29.20*
Test Administration	1	2205.00	59.03*
Subjects (Groups)	88	115.18	
Group x Test Administration	1	5802.69	155.34*
Subjects x Test Administration (Groups)	88	37.36	

* $p < .01$

Table 11

Means and Standard Deviations of Scores on the Criterion-Referenced
Test on Instructional Games

Group ^a	Test Administration I		Test Administration II	
	Mean	Standard Deviation	Mean	Standard Deviation
A	23.51	4.25	33.42	4.31
B	34.40	5.11	29.78	4.30

^an = 45 for each group

Table 12
Two-Factor Repeated-Measures Analysis of Variance of Scores
on the Criterion-Referenced Test on Instructional Games

Source	df	MS	F
Groups	1	590.42	25.09*
Test Administration	1	314.69	18.44*
Subjects (Groups)	88	23.53	
Group x Test Administration	1	2376.20	139.21*
Subjects x Test Administration	88	17.07	

* $p < .01$

(AO₂) ($p < .01$). In addition, in a pre-posttest comparison, the mean score of those who had worked through the instructional games module in the second trial (AO₄) was significantly higher than their mean score from the first trial (AO₂) ($p < .01$).

Pretesting on the content of an audiovisual training module does not affect attainment of competencies prespecified in the objectives of the module.

To test this hypothesis comparisons were made of scores obtained on the criterion-referenced tests for each topic in the non-pretest and pretest conditions. Scores on AO₁ were compared with scores on BO₃. AO₁ represents the test scores on parent-tutoring in the absence of a pretest and BO₃ represents scores on the parent-tutoring test for subjects who had taken the corresponding pretest (BO₁) three weeks earlier. Again on the basis of the significant interaction effect between groups and test administrations shown in Table 12, Scheffé's test was employed to test differences between means of these two groups. The multiple-comparison test revealed no significant difference between the means. A similar comparison of scores on the test on instructional games under both non-pretest (BO₂) and pretest (AO₄) conditions revealed no significant effects on learner attainment of competencies.

Competencies attained from working through an audiovisual training module are maintained over time.

The same two-factor repeated-measures analyses of variance (Tables 10 and 12) were used to test this hypothesis. Scheffé's multiple-

comparison test applied to the mean scores on immediate and delayed administration of the criterion-referenced test on parent-tutoring (AO_1 and AO_3) revealed a significant decline in the scores after the three-week delay ($p < .05$). A similar comparison of scores obtained on the test on instructional games (BO_2 and BO_4) also revealed that the mean scores on the delayed posttest were significantly lower than the mean scores on the immediate posttest ($p < .025$). Thus, this hypothesis was rejected.

Previous experience and background of subjects do not affect the attainment of competencies prespecified in the objectives of the module.

A series of multiple regression analyses were conducted to test the effects of experience and background of the subjects on scores obtained on criterion-referenced tests. First, the dependent measures of age, teaching experiences, educational level and number of special education courses taken were tested against pretest scores (AO_2 and BO_1). No significant predictors were discovered. Secondly, age, teaching experience, educational level, number of special education courses and pretest scores were employed as dependent measures and tested against posttest scores (AO_4 and BO_3). None of the dependent variables either separately or in combination showed any significance as predictors of posttest scores. This hypothesis was therefore confirmed.

Attitudes of learners who have worked through a module are more positive toward the content of the module than attitudes of learners who have not.

This hypothesis predicted that the scores obtained on the attitude scale on parent-tutoring with subjects who had worked through the module on parent-tutoring would be significantly higher than those of the other subjects. To test this hypothesis, comparisons were made among mean scores obtained on AL_1 , BL_1 , AL_3 , and BL_3 . Table 13 shows the means and standard deviations for these scores by both group and test administration. A two-factor repeated-measures analysis of variance (Table 14) revealed a significant interaction between groups and test administrations. Applying Scheffé's multiple-comparison test, the mean score obtained on BL_2 was found to be significantly less than the mean scores for all other groups ($p < .01$).

The same statistical procedure was applied with reference to the instructional game module. Comparisons were made of scores obtained on the attitude scale on instructional games (AL_2 , BL_2 , AL_4 , and BL_4). Table 15 shows the means and standard deviations of these scores. A two-factor repeated-measures analysis of variance (Table 16) failed to identify any significant interaction between groups and test administrations, indicating no significant differences in attitude toward instructional games. Thus the hypothesis on attitude-score gains was confirmed in the case of parent-tutoring and rejected in the case of instructional games.

Attitude toward the audiovisual training module format changes positively as a result of working through such modules.

Before subjects were exposed to treatments, a semantic differential to measure attitudes toward the self-instructional format (S_1) was

Table 13
Means and Standard Deviations of Attitude
Scores Toward Parent-Tutoring

Group ^a	Test Administration I		Test Administration II	
	Mean	Standard Deviation	Mean	Standard Deviation
A	79.42	8.58	78.53	6.37
B	73.80	8.07	80.44	7.23

^an = 45 for each group

Table 14
Two-Factor Repeated-Measures Analysis of Variance of Attitude
Scores Toward Parent-Tutoring

Source	df	MS	F
Groups	1	154.94	1.72
Test Administration	1	372.67	14.43*
Subjects (Groups)	88	89.92	
Group x Test Administration	1	638.45	24.71*
Subjects x Test Administration (Groups)	88	25.83	

* $p < .01$

Table 15
Means and Standard Deviations of Attitude
Scores Toward Instructional Games

Group ^a	Test Administration I		Test Administration II	
	Mean	Standard Deviation	Mean	Standard Deviation
A	81.91	15.09	85.27	9.15
B	85.20	8.48	83.51	10.83

^an = 45 for each group

Table 16
Two-Factor Repeated-Measures Analysis of Variance
of Attitude Scores Toward Instructional Games

Source	df	MS	F
Groups	1	26.45	0.17
Test Administration	1	31.25	0.33
Subjects (Groups)	88	154.58	
Group x Test Administration	1	286.27	2.99
Subjects x Test Administration (Groups)	88	95.70	

administered. At the conclusion of the second trial the same semantic differential (S_2) was readministered to all subjects. A one-factor repeated-measures analysis of variance was carried out to compare scores on S_1 with S_2 . Table 17 shows the mean and standard deviation for each test and Table 18 summarizes the results of the analysis of variance. As shown in the summary table, the mean score on S_2 was significantly higher than the mean score on S_1 ($p < .01$).

Discussion

The hypothesis on the attainment of prespecified competencies as a result of working through a module was accepted. Significant differences were obtained at the .01 level on criterion-referenced test scores between subjects who had worked through an assigned module and those who had not. The analysis of variance identified a significant interaction and the Scheffé tests revealed that mean scores of both experimental groups were significantly higher than those of the control groups. In addition, posttest scores were significantly higher than pretest scores ($p < .01$). This is illustrated in Figures 26 and 27.

The hypothesis concerning the absence of any pretest effects was accepted. In the case of both modules no significant differences were uncovered by Scheffé's multiple-comparison tests between mean scores of experimental groups in Trial I (without pretest) and Trial II (with pretest). This anticipated result is in keeping with Hartley's (1971) findings on the effects of pretesting with efficient instructional materials.

The hypothesis on the maintenance of competencies over time was

Table 17

Means and Standard Deviations of Scores on Semantic Differential
Attitude Towards Self-Instructional Materials

Pretest (S ₁)		Posttest (S ₂)	
Mean	Standard Deviation	Mean	Standard Deviation
63.86	10.45	72.46	7.74

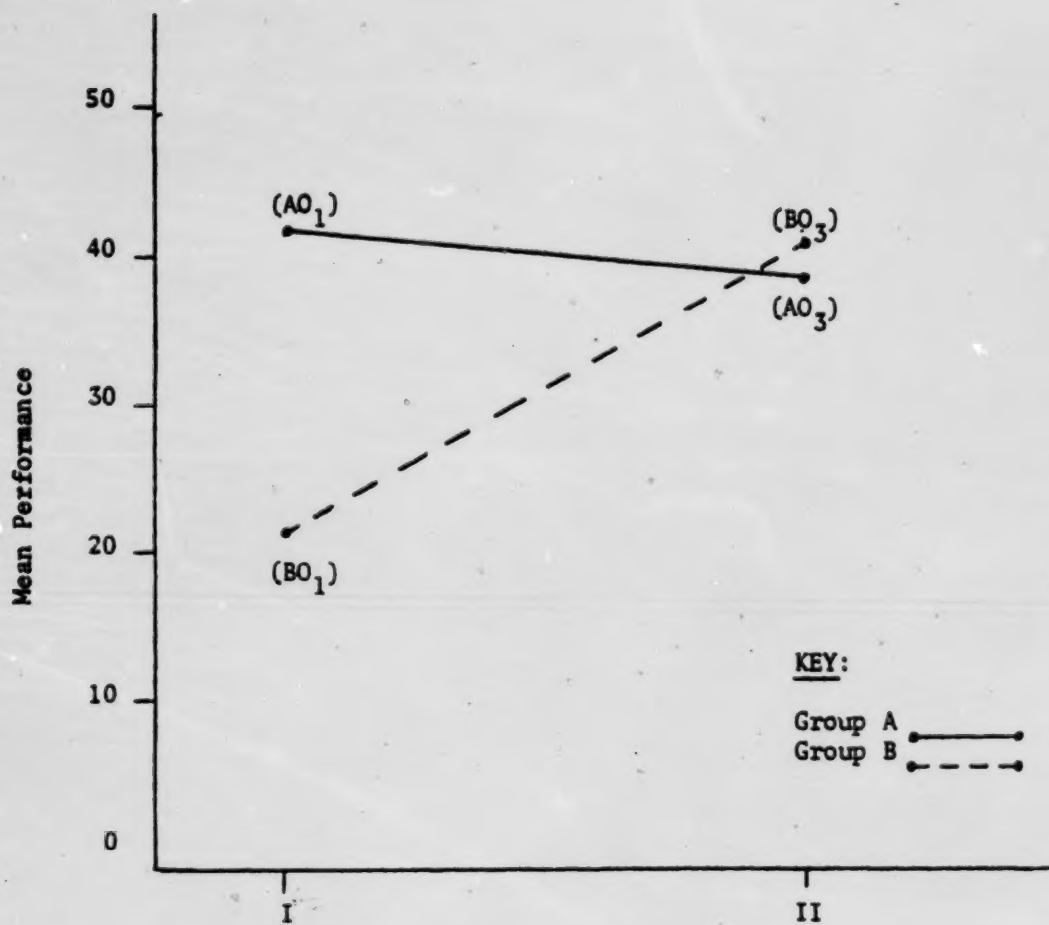
N = 90 subjects

Table 18

One-Factor Repeated-Measures Analysis of Variance of Scores
on Semantic Differential on Attitude Toward Self-Instructional Materials

Source	df	MS	F
Total	179	102.67	
Between subjects	89	93.14	
Testing	1	3328.20	43.82*
Error (Testing)	89	75.95	

* $p < .01$



Test Administrations

Figure 26

Mean Performance of Groups on the Criterion-Referenced Test on Parent-Tutoring

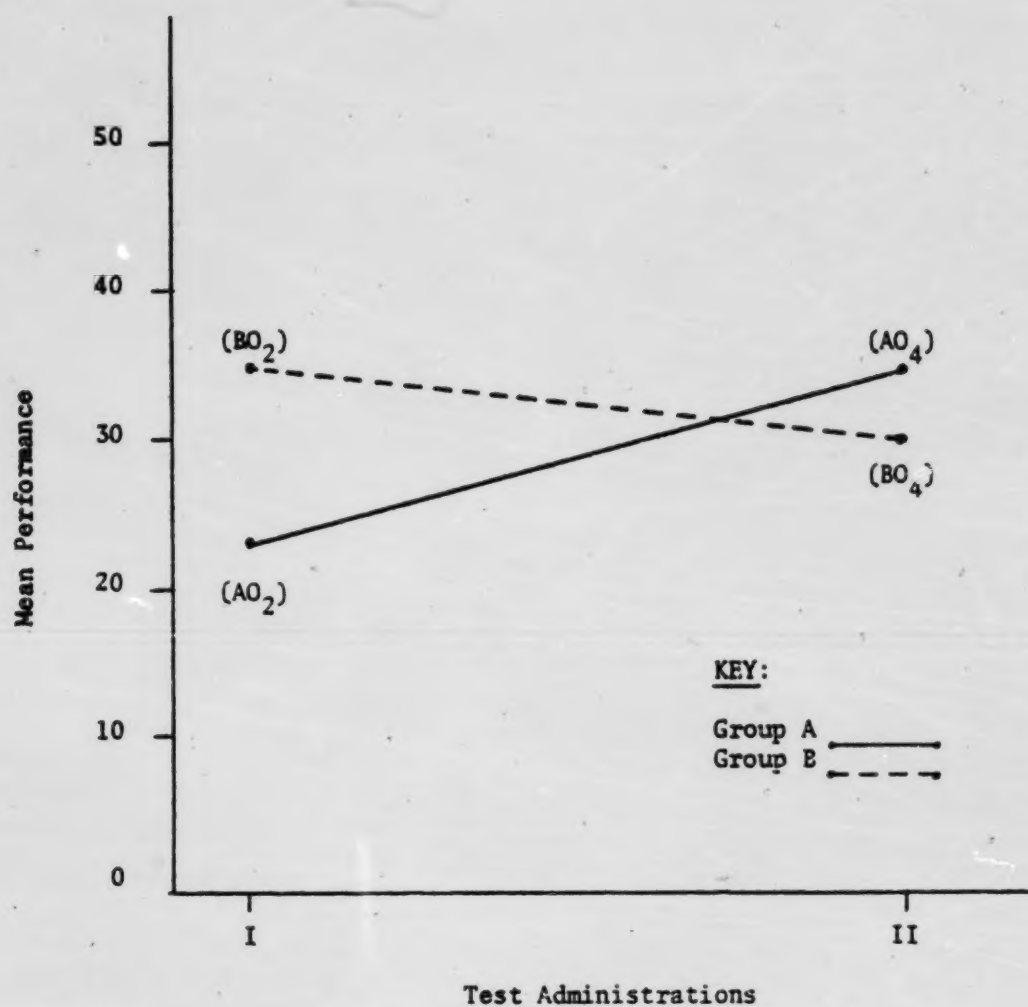


Figure 27

Mean Performance of Groups on the Criterion-Referenced
Test on Instructional Games

rejected. Mean scores on the criterion-referenced tests indicated a significant difference between immediate and delayed posttest scores ($p < .05$ for parent-tutoring and $p < .025$ for instructional games). A close inspection of all posttest scores in Trial II shows a drop in the overall scores from Trial I. This may be attributed to two factors:

Test fatigue. A number of subjects in Trial II wrote that they had already answered some of the questions in Trial I instead of providing an answer. In all such cases the investigator took the conservative decision of scoring these test responses as zero. This lowered Trial II posttest scores and may have contributed to the significant decline.

Lack of follow up. Between trials, instructors were requested not to discuss the content of the modules with subjects in order to prevent contamination. This lack of follow up activities with preservice teachers who had little opportunity for applying the competencies they had acquired probably contributed to a certain amount of forgetting over the three-week period.

The hypothesis on lack of effects of background and experiences was accepted. The four multiple regression analyses conducted on the dependent measures using the independent measures of age, level of education, amount of teaching experience and number of special education courses for the pretest condition (AO_2 , BO_1) and with the addition of pretest scores as a dependent measure for the posttest condition (AO_4 , BO_3) failed to turn up any significant relationships. A second inspection of the background data failed to suggest any other unnamed background variable likely to account for the variance in the dependent measures.

The hypothesis on attitudinal gains as a result of working through the modules was accepted with some reservations. As indicated by the analysis of variance on the attitude scores toward parent-tutoring, significant differences were found between groups which had worked through the module and those which had not ($p < .01$). This is shown in Figure 28. However, with instructional games, the mean attitude score for the control group was so high ($\bar{X} = 81.91$ on a scale of 20 to 100) that a ceiling effect probably prevented the mean score of the experimental group from differing significantly, even though its mean score was higher ($\bar{X} = 85.20$). Similarly, the mean attitude score of the control group became more positive ($\bar{X} = 85.27$) after they worked through the instructional games module. But once again this increase was not significant. Figure 29 illustrates this result.

The hypothesis on attitude gain toward the format of the modules was accepted. Pre-and-post attitude scores differed so strongly that the investigator was encouraged to examine each item of the semantic differential individually. As graphically illustrated in Figure 30, every item shows a positive shift. It is interesting to note that the only item which has some factual base (costly-inexpensive) is the most negative on both pre-and-post measures. This suggests that despite their enthusiasm for the self-instructional format, the subjects are apprehensive about the cost of the modules.

Summary

The results of the study in relation to the hypotheses were presented in this chapter. Hypothesis 1 was confirmed through the actual

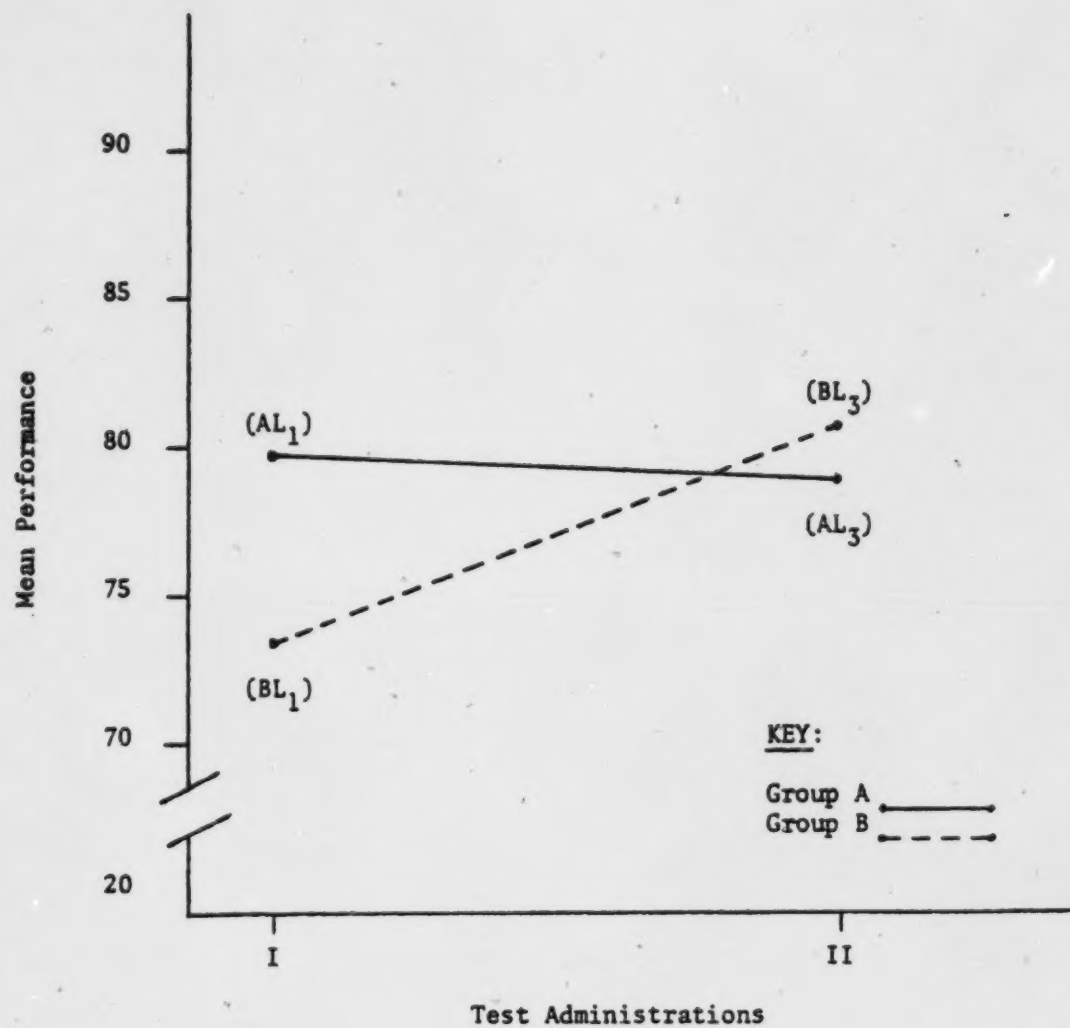


Figure 28

Mean Attitude Scores of Groups Toward Parent-Tutoring

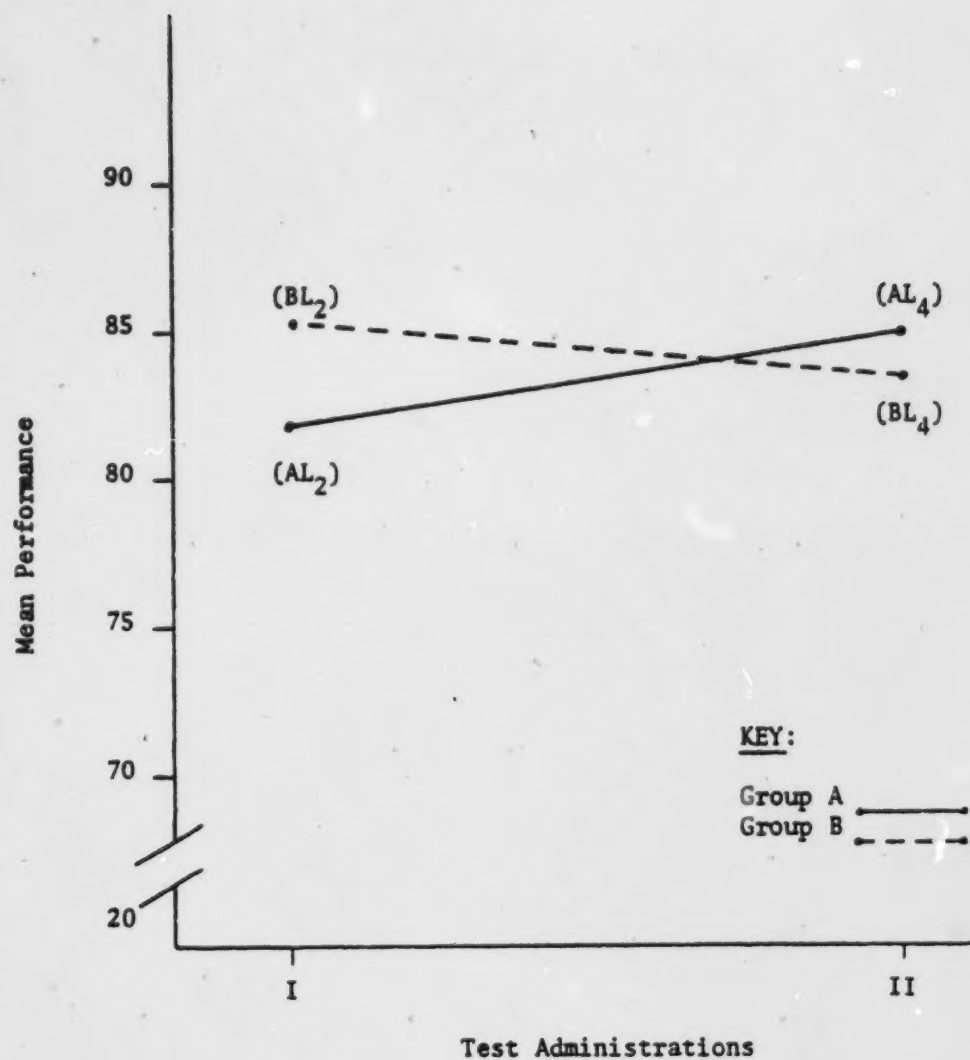
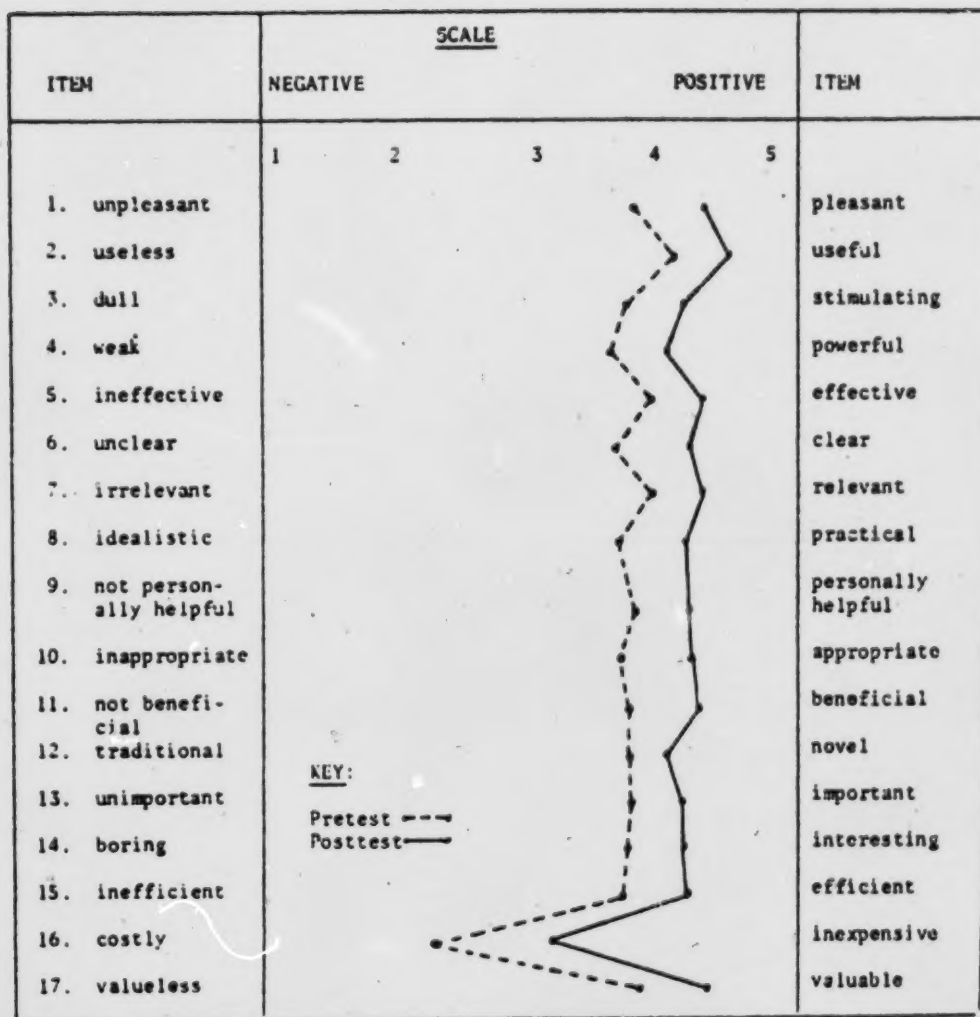


Figure 29

Mean Attitude Scores of Groups toward Instructional Games



N = 90 subjects

Figure 30

Mean Responses of Subjects to Items on the
Semantic Differential on Attitude Toward Self-Instructional Materials

production of two modules. Hypotheses 2 to 7 were tested by means of various statistical analyses. The results of these analyses were offered and discussed.

Chapter VII

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study investigated whether a generalized instructional development model can be adapted and applied to the production of audiovisual training modules. Related to this question was another: If an instructional development model can be adapted and applied to the production of audiovisual training modules do these modules produce demonstrable learning? A review of the literature on instructional development models revealed that although most of these specify a large number of common activities, none provide the specific guidelines required by a practitioner working with a prespecified media combination. On the basis of the review, the 4-D Model (Thiagarajan et al., 1974) was identified as coming closest to meeting the needs of the study. A second review of the literature on media-selection strategies suggested that the combination of audiocassette, print and filmstrips could provide the maximum number of attributes for the minimum cost and time requirements.

Logical modifications were made to the 4-D Model to accommodate the prespecified media combination. In particular, the step of media selection was replaced by that of media allocation. Other steps of the model were adapted to suit the audiovisual media combination. Two modules were produced following the guidelines laid down in the adapted model. The investigator developed an audiovisual training module on parent-tutoring. A second developer independently produced another audiovisual training module on instructional games for handicapped children.

Hypothesis 1 of this study stated that the adapted 4-D Model could be applied to produce audiovisual training modules. Hypothesis 2 stated that working through an audiovisual training module would enable learners to attain competencies prespecified in the objectives of the module. Hypothesis 3 suggested that pretesting on the content of a module would not affect attainment of the prespecified competencies. Hypothesis 4 predicted that competencies attained from the module would be maintained over time. Hypothesis 5 indicated that previous experience and background would not affect the attainment of the prespecified competencies. Hypothesis 6 stated that the attitudes of learners who worked through a module would become more positive toward the content of the module than the attitudes of those who did not. Hypothesis 7 suggested that the attitude toward the format of the module would become more positive as a result of working through such modules.

Two approaches were employed to test these hypotheses. For the first hypothesis, two developers applied the adapted 4-D Model to the actual design, development and evaluation of two separate and distinct modules. Completion of the modules was considered confirmation of the hypothesis. For the testing of the remaining hypotheses which dealt with the effectiveness of the modules in terms of learner outcomes, a carefully constructed experimental design was used. Ninety subjects, drawn from the target population for whom the modules had been designed, were randomly assigned to two groups. The two modules were also randomly assigned to these groups. All subjects completed a background/experience questionnaire and a semantic differential designed to measure their attitude toward self-instructional materials. The subjects then individually worked

through their assigned modules. On completion, they took a criterion-referenced test based on the objectives of both modules. They also responded to attitude scales on the content of both modules. After a three-week interval, the same subjects worked through the module they had not used before. The same series of criterion-referenced tests and attitude scales were administered as before. Finally, the semantic differential on self-instructional materials was once again administered. Criterion-referenced tests for each module were randomly distributed to a panel of experts for scoring using pre-established criteria. The experts were unaware of the identity of the subjects or the nature of the treatments. All scores were analyzed using a series of repeated-measures analyses of variance. A series of multiple regression analyses were employed to isolate any effects of backgrounds and experience of the subjects on test scores.

Results

1. Following the revised 4-D Model, two audiovisual training modules were produced and tested in the field.
2. Trainees who worked through an assigned module scored higher on a criterion-referenced test related to its content than trainees who worked through a different module ($p < .01$). In addition, there was a significant improvement ($p < .01$) between pre- and posttest scores of the same groups.
3. Pretesting had no significant effect on criterion-referenced test scores for either module.
4. Scores on delayed posttests were significantly lower than scores

on immediate posttests ($p < .05$ on the parent-tutoring module; $p < .025$ on the instructional games module). Although these results indicated a significant drop in scores, test fatigue and lack of follow up may account for this decline.

5. Age, level of education, years of education, and number of special education courses were all non-significant predictors of subjects' scores on criterion-referenced tests.

6. Attitudes toward parent-tutoring of subjects who worked through the module on parent-tutoring were significantly higher than those who did not work through this module ($p < .01$). This higher attitude was maintained three weeks after subjects had used the module ($p < .01$). The same trend occurred with the module on instructional games but at a non-significant level. This lack of significance was probably due to the fact that the subjects' attitudes were very positive to begin with. This ceiling effect prevented any significant increase in post attitude scores.

7. As a result of using the two modules, subjects' attitude toward self-instructional materials improved significantly ($p < .01$).

Conclusions

Before drawing any conclusions from these results, it must be pointed out that the findings suffer from a number of threats to their generalizability:

1. The audiovisual training modules in this study were produced specifically for teachers of the handicapped. Subjects employed in the study

were drawn from this population which has considerable sophistication in self-instructional skills. They were also probably more familiar with mediated instruction than most other populations. These factors suggest that the findings may not apply to populations which are different.

2. Although steps were taken to avoid reactivity in this study, the unusual format, equipment and evaluation procedures disrupted the subjects' routines. This novelty effect may prevent the findings from being generalized to regular instructional situations.

3. The summative-evaluation data only apply to the two modules and not to the adapted 4-D Model. The investigator is aware of the host of intervening variables which have not been taken into account. Other modules produced in the same manner could result in entirely different outcomes.

Within these limitations, the findings in this study do permit the following conclusions:

1. The revised 4-D Model can be applied to the production of self-instructional audiovisual training modules. The fact that two independent developers were able to produce two such usable modules suggests this conclusion.

2. Application of the revised 4-D Model can result in modules which are effective in terms of immediate competency acquisition. The repeated formative evaluation and revision of each component of the module results in efficient and replicable training. Although results obtained with these two modules cannot be generalized to others, the investigator sees no reason why subsequent applications of the 4-D Model by other developers cannot produce similar results.

3. As Hartley (1971) indicated, pretesting does not affect learning outcomes of efficient instructional materials.
4. Although the modules have an immediate effect on competency acquisition, these competencies are not maintained over time. This emphasizes the need for periodic follow-up activities. The strong immediate effect of the modules significantly diminishing over time suggests that the use of the modules should form a part of a planned program of integrated instructional activities.
5. The modules produce a significant improvement of the attitudes of the learners toward the content of the module. This suggests that where improving attitude toward a controversial topic is concerned, these modules can effectively produce satisfactory and sustained results. If there is a highly positive initial attitude toward a topic, however, the modules appear to have a positive but non-significant effect.
6. Application of the adapted 4-D Model with its numerous analyses, evaluations and revisions result in modules which permit trainees to attain prespecified competencies regardless of their background experiences. The repeated recycling of the intermediate versions produces an efficient module which is independent of the trainee's age, experience, educational level and course background.
7. Attitudes toward self-instructional materials can be significantly improved as a result of the trainees' experience with modules. Such an improved attitude toward the instructional format is a major desirable outcome of any developmental effort.

Recommendations

Because of limitations to generalizability discussed earlier, there

is a need to replicate this study using different content and target populations. In particular, the revised 4-D Model needs to be applied away from the institutional setting in which it was developed. Evaluation of the modules should be independent of the developers to eliminate any unintentional biases. This study has raised some issues which suggest further research:

1. Several subjects who participated in the summative evaluation suggested that they might have learned more if they had been allowed to work through each module in a series of short sessions. An investigation of the effectiveness of a "spaced" use of the modules versus the "massed" use may uncover some fruitful utilization principles.
2. Other generalized instructional development models may be adapted to suit specific media combinations to test the relationship between the model and the products.
3. Replications of this study using other media may be undertaken to test the generalizability of the 4-D Model.
4. A longer-term evaluation of the competencies acquired from an audio-visual training module should be undertaken to test the transfer effects of these modules.

References

- Allen, W. J. Media stimulus and types of learning. Audiovisual Instruction, 1967, 12(1), 27-31.
- Alkin, M. C. Accountability defined. Evaluation Comment, 1972, 3(3), 1-5.
- Anderson, R. H. Selection of media: Another perspective. Improving Human Performance: A Research Quarterly, 1974, 3(3), 81-107.
- Banathy, B. H. Instructional systems. Palo Alto, Ca.: Fearon Publishers, 1968.
- Barson, J. Instructional systems development: A demonstration and evaluation project. East Lansing: Michigan State University, U. S. Office of Education, Title III - B Project OE-3-16-025, 1967.
- Bell, R. R. Lower-class Negro mothers' aspiration for their children. Social Forces, 1965, 43, 493-500.
- Bretz, R. The selection of appropriate communications media for instruction. Santa Monica, Ca.: Rand Corporation, 1971.
- Briggs, L. J. Handbook of procedures for the design of instruction. Pittsburgh, Pa.: American Institute for Research, 1970.
- Briggs, L. J., Campeau, P. L., Gagne, R. M., & May, M. A. Instructional media: A procedure for the design of multi-media instruction, a critical review of research, and suggestions for further research. Pittsburgh, Pa.: American Institute for Research, 1967.
- Brown, J. E., Lewis, R. B., & Harclerod, F. F. A-V instruction: Materials and methods (4th ed.). New York: McGraw-Hill, 1973.
- Bushell, D., & Jacobson, J. M. A program for teaching mothers to be classroom tutors. University of Kansas, July 1968.
- Campbell, D. T., & Stanley, J. C. Experimental and quasi-experimental designs for research. Chicago: Rand McNally, 1963.
- Cavert, D. C. An approach to the design of mediated instruction. Washington, D. C.: Association for Educational Communications and Technology, 1974.
- Champagne, D. W., & Goldman, R. M. Teaching parents teaching. New York: Appleton-Century-Crofts, 1972.
- Chu, C., & Schramm, W. Learning from television: What the research says. Stanford, Ca.: The Institute for Communication Research, 1967.

- Colthorp, J. Production of 2" x 2" slides for school use. Austin, Tex.: University of Texas, Visual Instruction Bureau, 1958.
- Crawford, J. (Ed.). National research training manual (2nd ed.). Monmouth, Ore.: Teaching Research, 1969.
- Davies, I. Competency-based learning. New York: McGraw-Hill, 1973.
- Deutsch, M. Early social environment: Its influence on school adaptation. In F. M. Hechinger (Ed.), Pre-school education today. Garden City, New York: Doubleday and Co., 1966.
- Eachus, T. Additional considerations in support of a single media system. Unpublished manuscript, November 1972.
- Elam, S. Performance-based teacher education: What is the state of the art? Washington, D. C.: American Association of Colleges for Teacher Education, 1971.
- Faris, G. Would you believe an instructional developer? Audiovisual Instruction, 1968, 13(9), 971-973.
- Fink, A. H., Sitko, M. C., Semmel, M. I., & Shuster, S. K. The effects of games on motivational aspects of teacher-pupil interaction. Bloomington, Ind.: Center for Innovation in Teaching the Handicapped, Indiana University, 1971.
- Fleming, M. Perceptual principles for the design of instructional materials. Viewpoints: Bulletin of the School of Education, Indiana University, 46(4), 1970.
- Florida Department of Education. State and District Instructional Materials Councils policies and procedures: 1976 adoption. Tallahassee, Fla.: State of Florida Department of Education, May 1975.
- Gagne, R. M. Learning theory, educational media and individualized instruction. (Paper presented to a faculty development seminar) Bucknell University, 1970.
- Gallup, G. The third annual survey of the public's attitudes toward the public schools. Phi Delta Kappan, 1971, 53(1), 33-48.
- Goldman, R. M. Development of a training program to increase the use of reinforcers in informal teaching by mothers of educationally disadvantaged children. Unpublished doctoral dissertation. University of Michigan Dissertation abstracts, 1970.
- Goodman, R. Systematic selection. Audiovisual Instruction, 1971, 16(10), 37-38.

- Gordon, G. N. Classroom television: New frontiers in ITV. New York: Hastings House, 1970.
- Hamreus, D. G. The systems approach to instructional development. In The contribution of behavioral science to instructional technology. Monmouth, Ore.: Teaching Research, 1968.
- Hartley, J. The effects of pretesting on post-test performance following self-instruction: A summary. Paper presented to the Annual Convention of the National Society for Programmed Instruction, Rochester, N. Y., April 1971.
- Hoban, C. F. The state of the art of instructional films. ERIC document ED055432, Stanford, Ca.: ERIC Clearinghouse on Media and Technology, September 1971.
- Hodgson, D., & Bullen, H. J. How to use a tape recorder. New York: Hastings House, 1957.
- Hofmeister, A. The parent as an instructional agent. Logan, Utah: Project TELEPAC, Utah State University, 1975.
- Hofmeister, A. M., & Latham, G. Development and validation of a mediated package for training parents of preschool mentally retarded children. Improving Human Performance: A Research Quarterly, 1972, 1(1), 3-7.
- Holcomb, J. D., & Garner, A. E. Improving teaching in medical schools. Springfield, Ill.: Charles C. Thomas, 1973.
- Holmes, E. Reading guided by questions versus careful reading and re-reading without questions. School Review, 1931, 39, 361-367.
- Houston, W. R. Resources for performance-based education. Albany, N. Y.: The University of the State of New York, The State Education Department, 1973.
- Houston, W. R., & Howsam, R. B. (Eds.). Competency-based teacher education. Chicago: Science Research Associates, 1972.
- Karnes, M. B., Stadley, W. M., & Wright, W. R. An approach for working with parents of disadvantaged children: A pilot project. Urbana, Ill.: University of Illinois, 1966.
- Katz, I. Academic motivation and equal education opportunity. Harvard Educational Review, 1968, 36, 57-65.
- Kaufman, R. A. Educational system planning. Englewood Cliffs, N. J.: Prentice-Hall, 1972.
- Kellogg, W., & Payne, B. The true-false question as an aid in studying. Journal of Educational Psychology, 1938, 29, 581-589.

- Kemp, J. E. Planning and producing audiovisual materials (2nd ed.). Scranton, Pa.: Chandler Publishing Co., 1968.
- Kemp, J. E. Which medium. Audiovisual Instruction, 1971, 16(10), 32-36.
- Komoski, P. K. An imbalance of product quantity and instructional quality: The imperative of empiricism. AV Communication Review, 1974, 22(4), 357-386.
- Levie, W. H. Understanding instructional media. Unpublished manuscript, Indiana University, 1974.
- Levie, W. H., & Dickie, K. E. The analysis and application of media. In R. W. M. Travers (Ed.), Second handbook of research on teaching. Chicago: Rand McNally, 1973.
- Likert, R. A. A technique for the measurement of attitudes. Archives of Psychology, 1932, 140, 44-53.
- Littell, J. F. (Ed.). Coping with television. Evanston, Ill.: McDougal, Littell & Co., 1973.
- Lonigro, J. K., Jr., & Eschenbrenner, A. J. A model for selecting media in technical/vocational education. Audiovisual Instruction, 1973 18(9), 27-30.
- Lumsdaine, A. A. Instruments and media of instruction. In N. L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963.
- Mager, R. F. Developing attitude toward learning. Palo Alto, Ca.: Fearon, 1968.
- Mager, R. F. Measuring instructional intent. Belmont, Ca.: Fearon, 1973.
- Mattingly, G., & Smith, W. Introducing the single-camera VTR system: A layman's guide to videotape recording. New York: Scribner, 1973.
- McConnell, J. T. If the medium fits, use it! In Selecting media for learning: Readings from Audiovisual Instruction. Washington, D. C.: Association for Educational Communications and Technology, 1974.
- McKeachie, W. J., & Hiler, W. The problem-oriented approach to teaching psychology. Journal of Educational Psychology, 1954, 43, 224-232.
- Meredith, J. C. The CAI author/instructor: An introduction and guide to the preparation of computer-assisted instruction materials. Englewood Cliffs, N. J.: Educational Technology Publications, 1971.

- Mitchell, W. Televising your message: An introduction to television as communication. Skokie, Ill.: National Textbook Co., 1974.
- Moldstad, J. A. Summary of AV research. Audiovisual Instruction, 1964, 9, 492-497.
- Moldstad, J. A. Selective review of research studies showing media effectiveness: A primer for media directors. AV Communication Review, 1974, 22(4), 387-407.
- National Special Media Institutes. What is IDI? The Instructional Development Institute Program for School Districts (Brochure), 1971.
- Niedermeyer, F. C. Parent-assisted learning. Inglewood, Ca.: Southwest Regional Laboratory for Educational Research and Development, 1969.
- Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. The measurement of meaning. Urbana, Ill.: University of Illinois Press, 1957.
- Peck, R. F., & Tucker, J. A. Research on teacher education. Austin: University of Texas, Research and Development Center for Teacher Education (Mimeo), 1971.
- Piaget, J. Play, dreams, and imitations in childhood. New York: Norton, 1962.
- Pines, M. Revolution in learning: The years from birth to six. New York: Harper & Row, 1966.
- Postlethwait, S. N., Novak, J., & Murray, H. T. The audio-tutorial approach to learning. Minneapolis: Burgess Publishing Co., 1972.
- Procedures for instructional design: Proceedings of the 1972 Lincoln leadership conference on instructional design. Audiovisual Instruction, 1972, 17(8), 8-15.
- Reavis, K. Parent teaching package in math combinations. Norfolk, Va.: Old Dominion University, 1973.
- Rosenstein, A. B. A study of a profession and professional education. Los Angeles: University of California, School of Engineering and Applied Science, Reports Group, 1969.
- Rosner, B. (Chairman). The power of competency-based teacher education: Report of the committee on national program priorities in teacher education. Boston: Allyn & Bacon, Inc., 1972.
- Roush, R. E., & Holcomb, J. D. Teaching improvements in higher education: Medical education may be the leader. Phi Delta Kappan, 1974, 55(5), 333-340.

- Russell, J. D. Modular instruction. Minneapolis: Burgess Publishing Co., 1974.
- Samuels, S. J. The effect of post-test relevant pretests and discussion type feedback on learning and retention. Psychonomic Science, 1969, 16, 67-68.
- Schramm, W. The research on programmed instruction: An annotated bibliography. Bulletin 1964, No. 35, OE-34-34. Washington, D. C.: Office of Education, U. S. Department of Health, Education, and Welfare, 1964.
- Semmel, M. I., Olson, J. R., & Weiske, W. M. An information and technical manual for the computer-assisted teacher training system (CATTS). Bloomington, Ind.: Center for Innovation in Teaching the Handicapped, Indiana University, 1972.
- Semmel, M. I., & Thiagarajan, S. Tips for teachers: Design, development and evaluation of a series of competency-based criterion-referenced teacher training modules (Proposal submitted to the U. S. Office of Education, Bureau of Education for the Handicapped). Bloomington, Ind.: Center for Innovation in Teaching the Handicapped, Indiana University, 1972.
- Silberman, H. F. Self-teaching devices and programmed materials. Review of Educational Research, 1962, 32, 179-193.
- Spottiswood, R. Film and its techniques. Berkeley: University of California Press, 1957.
- Stamas, S. Instructional models. In Occasional papers. Washington, D. C.: Division of Instructional Development, Association for Educational Communications and Technology, 1973.
- Stolovitch, H., & Thiagarajan, S. Alternative approaches to media selection. Educational Technology, 1975 (In press).
- Thiagarajan, S., Semmel, D., & Semmel, M. I. Instructional development for training teachers of exceptional children: A sourcebook. Minneapolis: Leadership Training Institute/Special Education, University of Minnesota, 1974.
- Tiemann, P. W. Toward accountability: Learner verification as the next step. NSPI Newsletter, 1975, 14(1).
- Tracey, W. R., Flynn, E. B., Jr., & Legere, C. L. Systems approach gets results. In W. McGehee, & P. Thayer (Eds.), Training in business and industry. New York: John Wiley and Sons, 1967.
- Twelker, P. A., Urbach, F. D., & Buck, J. E. The systematic development of instruction: An overview and basic guide to the literature. Stanford, Ca.: ERIC Clearinghouse on Media and Technology, March 1972.

- Vander Meer, A. W. Specific contributions of films to science-teaching. School Review, 1941, 49(9), 693-703.
- Van Mondfrans, A. P., & Houser, R. N. Selecting media to present basic concepts. Educational Technology, 1970, 10(12), 40-43.
- Warr, P. B., Baird, M. W., & Rackam, N. Evaluation of management training. London: Gower Press, 1970.
- Washburne, J. N. The use of questions on social science material. Journal of Educational Psychology, 1929, 20, 321-359.
- Wong, M. R., & Raulerson, J. D. A guide to systematic instructional design. Englewood Cliffs, N. J.: Educational Technology Publications, 1974.
- Wyman, R. Toward a single system for individual study. Audiovisual Instruction, 1973, 18(2), 29-30.
- Wyman, R. Needed: A new filmstrip. Audiovisual Instruction, 1974, 19(10), 45-46.

APPENDIX A

Learner-Analysis ChecklistSubject-Matter Competence

1. At what levels are the trainees' current knowledge and skills in the subject-matter area?
2. What background experiences do the trainees have in the subject-matter area?
3. Are the trainees likely to have any major misconceptions in the subject-matter area?

Attitudes

4. What are the general attitudes of the trainees toward the instructional content? Are there any subtopics within the content toward which the trainees are likely to feel very positive or very negative?
5. What preferences for instructional format and media do the trainees have?

Language

6. What is the language level of the trainees? How much of the specialized terminology is in their vocabularies?
7. What preferences for style of language (e.g., conversational or scholarly) do the trainees have?

Tool Skills

8. Do the trainees have any sensory-perceptual deficiencies that will require special attention?
9. Can the trainees handle the instructional materials and equipment?

APPENDIX B

Learner Analysis for an Audiovisual Training Module
on Parent Tutoring

Subject-Matter Competence

Trainees have some basic knowledge of handicapped children and special classrooms. They have had some experience in dealing with parents of handicapped and with paraprofessionals. Most of the trainees have never formally approached parents to engage their tutoring services. The trainees are largely unaware of the potential value of establishing a parent-tutoring program.

Attitudes

The trainees' attitudes toward the use of parents as tutors range from slightly positive to negative. Many are fearful of parents getting "too involved."

The trainees prefer individually accessible, self-paced materials, preferably ones which require minimal set-up skills. They respond positively to a self-instructional media package.

Language

The trainees possess a sophisticated vocabulary about handicapped children and special education. Their educational levels and backgrounds are sufficient to cope with the training toward establishing and maintaining parent-tutoring programs. They prefer simple, conversational English with concrete and familiar examples.

Tool Skills

Trainees do not have any major handicapping conditions. With some instruction, they are able to handle media equipment.

APPENDIX C

Context-Analysis Checklist

1. Who are the major target-trainees?
2. Is the material to be used with an instructor?
3. What major delivery systems are required?
4. How is the material to be introduced and integrated into a total program?
5. What support facilities are available?
6. What media equipment are available?
7. What extrinsic reward systems are operative?
8. What type of testing and grading is employed?
9. What are the cost constraints?
10. What are the scheduling constraints?

APPENDIX D

Context Analysis for an Audiovisual Training Module
on Parent Tutoring

1. Target-trainees. Both preservice and inservice teachers of the handicapped.
2. Instructor. For inservice trainees, a coordinator issues the parent-tutoring material and monitors its use. For preservice trainees, there is a faculty advisor.
3. Delivery systems. Essentially for individual or small-group use, but capable of being used with large groups as well.
4. Introduction/integration into a total program. Modular format to permit flexible use in a variety of special education courses.
5. Utilization facilities. Learning resource centers, libraries, study carrels, student home facilities.
6. Media equipment. Individual filmstrip viewers, audiocassette players, synchronized sound-filmstrip viewers.
7. Extrinsic reward systems. For inservice teachers, the parent-tutoring module can form part of a course for college credit, be applied toward certification. For preservice trainees, the module contributes toward course credit.
8. Testing and grading. As the module is competency-based, tests are performance oriented and grading follows a mastery-learning format.
9. Cost constraints. Under \$50 purchase price for the complete module.
10. Scheduling constraints. The module must be of less than 60 minutes duration, and provide for approximately 30 to 60 minutes of follow-up activities.

APPENDIX E

Instructional Requirements for an Audiovisual Training Module on Parent Tutoring

Content Requirements

1. Discuss the design and implementation of a parent-tutoring program which can be applied by classroom teachers of handicapped children.
2. List concrete advantages to encourage teachers and parents to volunteer for participation in a parent-tutoring program.
3. Provide techniques for establishing and maintaining parent-tutoring programs.

Style and Format Requirements

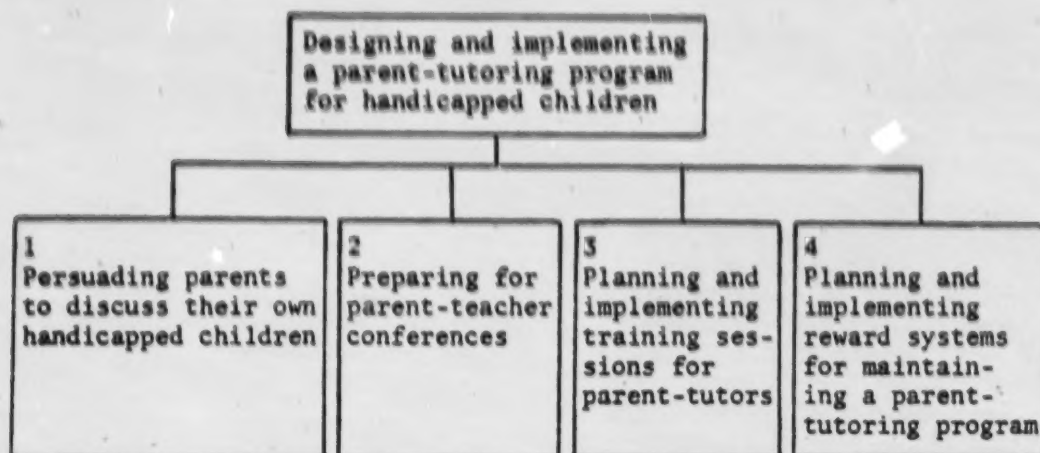
1. Require minimal entry skills on the part of the trainees.
2. Use a professional, yet conversational language.
3. Provide concrete and familiar examples.
4. Provide for multi-sensory inputs.
5. Provide for frequent active trainee participation.

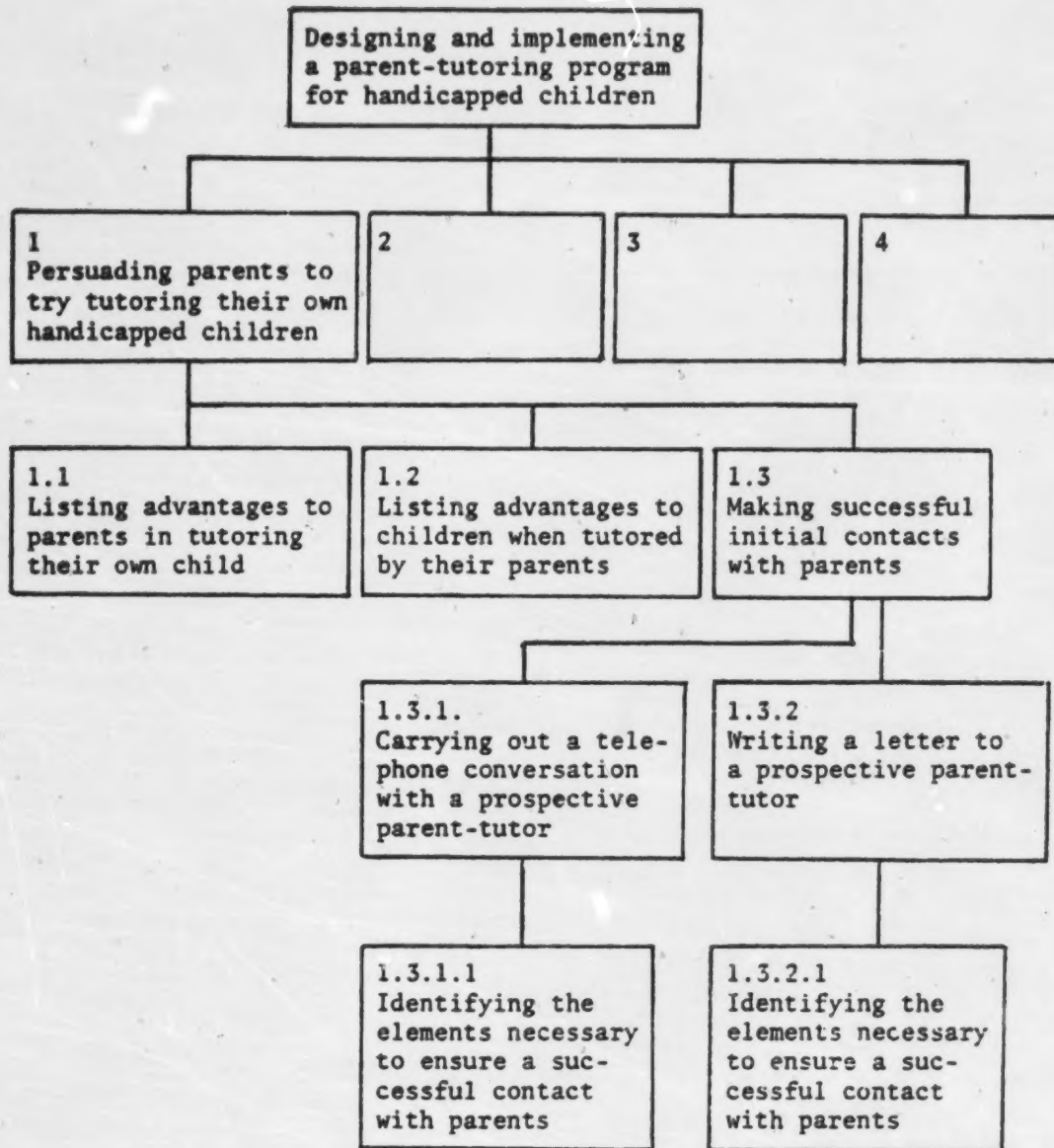
Utilization Requirements

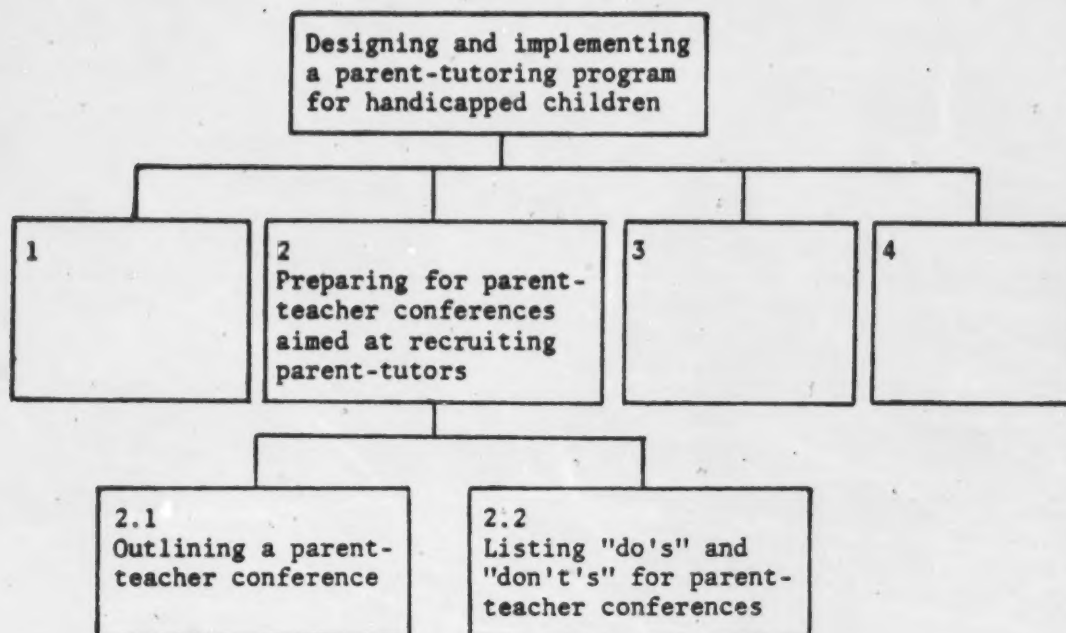
1. Use a self-contained format for flexible modular use.
2. Produce modules for individual use. However, allow for small and large-group use as well.
3. Make the modules portable for ease of transportation.
4. Check the format to fit most filmstrip viewers and audiocassette recorders.
5. Each complete module should cost no more than \$50.
6. The length of the module should be 30 to 60 minutes with provisions for additional trainee activities.

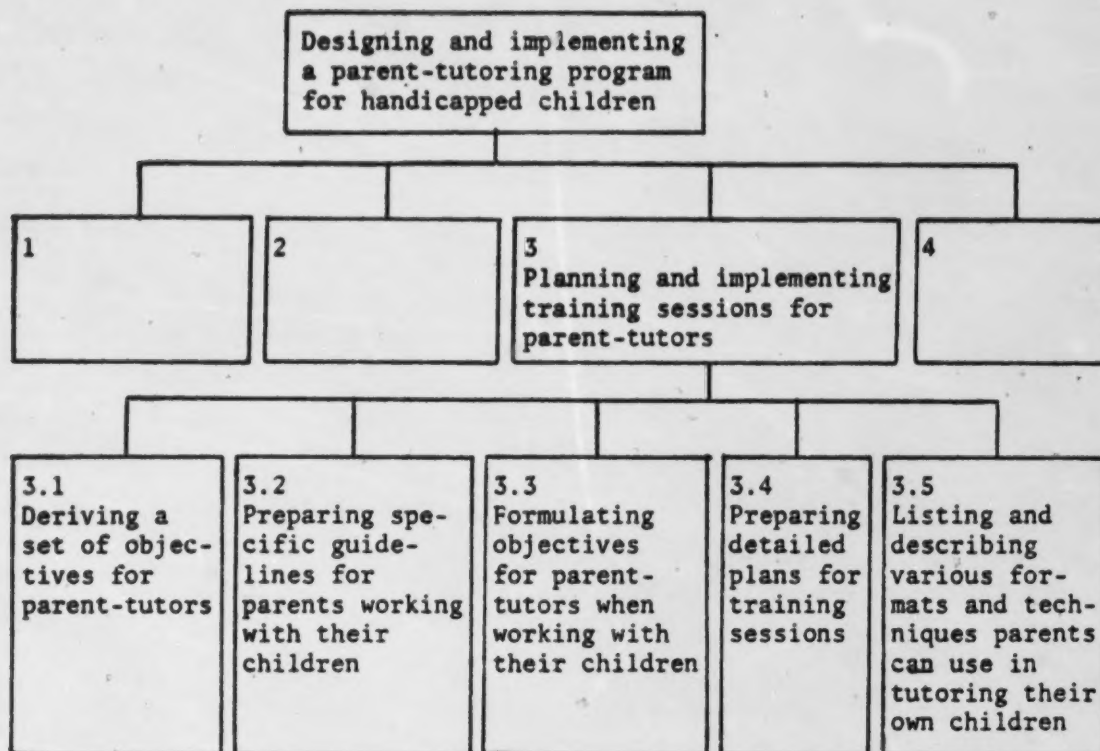
APPENDIX F

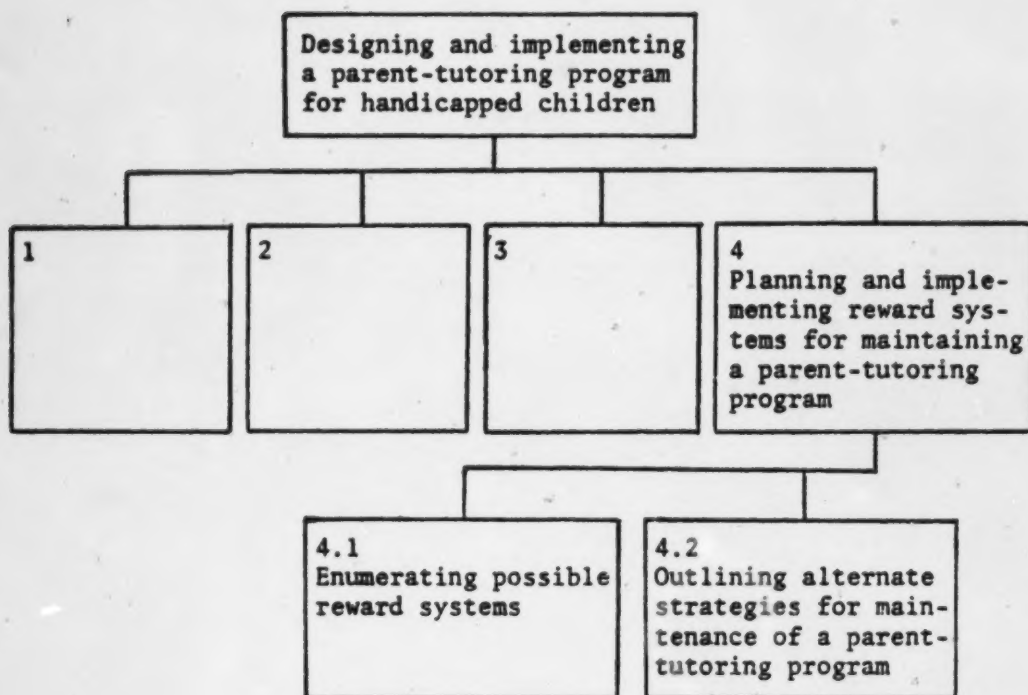
Task Analysis for an Audiovisual Training Module
on Parent Tutoring











APPENDIX G

Analysis of the Concept "Programmed Tutoring by Parents"Critical Attributes

1. Tutorial nature. The system is designed for use by one parent-tutor working with his/her own child.
2. Parent-user. The system is designed for use by a parent without the need for any complex decision-making competencies.
3. Programmed content. The tutoring system includes content materials which are systematically structured or sequenced.
4. Programmed performance. The tutoring system contains explicit instructions for the parent-tutor's interactions with his/her child.

Variable Attributes

1. Type of content. The subject-matter area and the instructional objectives of the parent-tutoring system may vary.
2. Type of pupil. The parent-tutoring system may be used with any type of child.
3. Instructional purpose. The tutoring system may be used for initial, remedial, and/or enrichment instruction.

APPENDIX H

Instructional Objectives for an Audiovisual Module
on Parent Tutoring

General Objective

Upon completion of the module, the teacher shall design and implement a system which will enable parents to actively participate in the tutoring of their handicapped children.

Specific Objectives

1. Provide a list of advantages in having parents tutor their children. Persuade a parent to try tutoring his/her child.
2. Carry out a telephone conversation with a prospective parent-tutor as an initial step in designing a parent-tutoring program.
3. Identify the elements necessary in ensuring a successful contact with parents.
4. Write a letter for establishing initial contact with a parent as a first step in implementing a tutoring program.
5. Prepare an outline for a parent-teacher conference aimed at recruiting the parents into a tutoring program.
6. Derive a set of training objectives for parent-tutors.
7. Prepare specific guidelines for parents working with their children.
8. In a given situation, formulate objectives for parents tutoring their own handicapped children.
9. Prepare a detailed plan for training sessions for parent-tutors in your own situation. Implement this plan.
10. List and describe various formats and techniques which parents can use in tutoring their handicapped children.
11. Prepare a detailed plan for maintaining the motivation of parents in tutoring their children. Implement this plan.

APPENDIX I

Evolution of a Response Book Item to Match the First Objective
of the Module

"Parents As Partners in Teaching Handicapped Children"

Objective 1

Provide a list of advantages in having parents tutor their children.
Persuade a parent to try tutoring his/her child.

Criterion Item

First version. What advantages can you name for a fellow teacher to pass on to parents he/she wanted to involve in a parent-tutoring program?

Second version. Gwen Davis, a pupil in your class, needs extra help in coping with her school work--help you feel her parents can best provide. Think of your own classroom situation and prepare a list of arguments you would put forward to Mrs. Davis, a concerned parent, to enlist her aid in working with her child.

Final version. Gwen Davis, a pupil in Mrs. Merton's class, needs extra help in coping with some of her school work--help which Mrs. Merton feels only her parents can provide. Think of your own classroom situation and prepare a list of arguments you would put forward to Mrs. Davis to enlist her aid in joining a program in which she will be actively engaged in teaching her child.

APPENDIX J

Checklist: Language ReviewDirections

Rate the material on each of the following items by circling the appropriate number in the five-point scale. In addition, edit and rewrite the material as needed.

- | | | |
|--|-----------|----------------------------------|
| 1. Poorly organized | 1 2 3 4 5 | Well organized |
| 2. Ineffective use of captions | 1 2 3 4 5 | Effective use of captions |
| 3. Too long or too short for the topic | 1 2 3 4 5 | Optimum length for the topic |
| 4. Confusing | 1 2 3 4 5 | Clear |
| 5. Wordy, rambling | 1 2 3 4 5 | Brief, concise |
| 6. Awkward | 1 2 3 4 5 | Fluent |
| 7. Inefficient organization | 1 2 3 4 5 | Efficient organization |
| 8. Technical terms left undefined | 1 2 3 4 5 | Technical terms defined properly |
| 9. Too formal or too informal | 1 2 3 4 5 | Suitable style |
| 10. Inconsistent | 1 2 3 4 5 | Consistent |
| 11. Dialogue stilted | 1 2 3 4 5 | Dialogue fluent |
| 12. Too many or too few examples | 1 2 3 4 5 | Appropriate number of examples |
| 13. Examples are distracting | 1 2 3 4 5 | Examples are useful and relevant |

Comments: _____

Suggestions: _____

APPENDIX K

Checklist: Appropriateness of Instructional ContentDirections

Critically inspect the instructional package and all adjunct materials. Evaluate the appropriateness of the material with respect to the goals and objectives of special education. Rate each item on the basis of 5 points for outstanding quality, 4 points for better than average, 3 points for average, 2 points for below average, and 1 point for unacceptable. Circle the appropriate number to indicate your rating. On the second section of this checklist, please give your suggestions for improving the materials.

- | | | | | | |
|--|---|---|---|---|---|
| 1. Relevance of the stated objectives of the material to the general goals of teaching exceptional children. | 1 | 2 | 3 | 4 | 5 |
| 2. Meaningfulness of the objectives to the teacher. | 1 | 2 | 3 | 4 | 5 |
| 3. Meaningfulness of the objectives to the parent. | 1 | 2 | 3 | 4 | 5 |
| 4. Sources from which the objectives are derived. | 1 | 2 | 3 | 4 | 5 |
| 5. Stated rationale for the objectives. | 1 | 2 | 3 | 4 | 5 |
| 6. Relevance of the content to the objectives. | 1 | 2 | 3 | 4 | 5 |
| 7. Theoretical soundness of the content. | 1 | 2 | 3 | 4 | 5 |
| 8. Adequacy of definitions and explanations. | 1 | 2 | 3 | 4 | 5 |
| 9. Use of technical terms, formulae, and notations. | 1 | 2 | 3 | 4 | 5 |
| 10. Number of examples. | 1 | 2 | 3 | 4 | 5 |
| 11. Authenticity of examples. | 1 | 2 | 3 | 4 | 5 |

Suggestions: _____

APPENDIX L

Checklist: Effectiveness of Instructional MaterialsDirections

Critically inspect the instructional package. Suggest modifications in each of the following aspects for improving the effectiveness of the material.

1. Statement of objectives
2. Response book items
3. Instructional content
4. Level of language
5. Style of presentation
6. Instructional activities
7. Difficulty level
8. Sequence of presentation
9. Practice and review
10. Feedback to trainee
11. Instructor's manual

APPENDIX M

Checklist: Feasibility of Instructional MaterialsDirections

Critically inspect the instructional package. Evaluate the usability of the material in a typical school setting. Rate each item on the basis of 5 points for considerably usability, 4 points for better than average usability, 3 points for average usability, 2 points for below-average usability, and 1 point for virtual unusability. Circle the appropriate number to indicate your rating.

- | | | | | | |
|---|---|---|---|---|---|
| 1. Adequacy of packaging. | 1 | 2 | 3 | 4 | 5 |
| 2. Availability of supplementary materials. | 1 | 2 | 3 | 4 | 5 |
| 3. Reusability of the materials. | 1 | 2 | 3 | 4 | 5 |
| 4. Equipment requirements. | 1 | 2 | 3 | 4 | 5 |
| 5. Space requirements. | 1 | 2 | 3 | 4 | 5 |
| 6. Preparation time. | 1 | 2 | 3 | 4 | 5 |
| 7. Training time. | 1 | 2 | 3 | 4 | 5 |
| 8. Scheduling requirements. | 1 | 2 | 3 | 4 | 5 |
| 9. Cost. | 1 | 2 | 3 | 4 | 5 |
| 10. Instructor's manual. | 1 | 2 | 3 | 4 | 5 |
| 11. Procedure for use. | 1 | 2 | 3 | 4 | 5 |
| 12. Flexibility of use. | 1 | 2 | 3 | 4 | 5 |
| 13. Special skills required for use. | 1 | 2 | 3 | 4 | 5 |
| 14. Potential acceptance by teacher trainers. | 1 | 2 | 3 | 4 | 5 |
| 15. Potential acceptance by teacher trainees. | 1 | 2 | 3 | 4 | 5 |

Suggestions for improvement: _____

APPENDIX N

Audio Checklist

	Good	Adequate	Unacceptable
1. Are voices clear?	_____	_____	_____
2. Can every word be understood?	_____	_____	_____
3. Are there distracting noises in the narration?	_____	_____	_____
4. Are there tape noises?	_____	_____	_____
5. Can sub-audible tones be heard?	_____	_____	_____
6. Are audible tones clear?	_____	_____	_____
7. Is synchronization correct?	_____	_____	_____
8. Are there any script errors?	_____	_____	_____
9. Can edit sounds be heard?	_____	_____	_____
10. Are voices credible?	_____	_____	_____
11. Are pauses the right length?	_____	_____	_____
12. Do record and playback speeds match?	_____	_____	_____
13. Is music appropriate?	_____	_____	_____
14. Is music well-integrated?	_____	_____	_____
15. Is music level balanced with narrator?	_____	_____	_____
16. Is there sufficient leader?	_____	_____	_____

--	--	--

Rerecord Modify Retain

APPENDIX O

Response Book Checklist

	Good	Adequate	Unacceptable
1. Is type legible?	_____	_____	_____
2. Is there sufficient space for answers?	_____	_____	_____
3. Are print colors correct?	_____	_____	_____
4. Is the paper stock correct?	_____	_____	_____
5. Is the page clean?	_____	_____	_____
6. Is the layout clear?	_____	_____	_____
7. Is the page numbered correctly?	_____	_____	_____
8. Are there any typographical errors?	_____	_____	_____
9. Is the language clear?	_____	_____	_____
10. Do printed instructions match verbal/ visual instructions	_____	_____	_____
11. Is the language consistent with other items?	_____	_____	_____

--	--	--

Reprint

Modify

Retain

APPENDIX P

A Checklist for Visuals

	Good	Adequate	Unacceptable
1. Is picture in focus?	_____	_____	_____
2. Is there sufficient depth of focus?	_____	_____	_____
3. Is exposure correct?	_____	_____	_____
4. Is the lighting correct?	_____	_____	_____
5. Is color balance correct? Is color even?	_____	_____	_____
6. Is the object of importance prominent enough?	_____	_____	_____
7. Are there distracting elements in the picture?	_____	_____	_____
8. Are words legible?	_____	_____	_____
9. Does the picture match the audio track?	_____	_____	_____
10. Is picture consistent with others?	_____	_____	_____
11. Is the picture mounted straight?	_____	_____	_____
12. Is the picture clean?	_____	_____	_____

--	--	--

Reshoot

Modify

Retain

APPENDIX Q

Learner Analysis for the Audiovisual Training Module
on Instructional Games for Handicapped Children

Subject-matter Competence

Trainees have a considerable theoretical knowledge of different types of handicapped children and special classrooms. They are knowledgeable enough in specific curricular areas to work with a topic for instructional game design. They have heard about instructional games and have seen them being used in special classrooms. However, very few of them have considered the possibility of designing a game. Their conception of instructional games is mostly limited to fun activities and "busy work."

Attitudes

The trainees' general attitude toward designing instructional games is positive, although they are somewhat skeptical as to the games' uses. Most of them believe that a game could be designed very easily, and the amount of time required for the design, tryout, and modification of a game will increase their skepticism.

These trainees do not like a textbook-lecture approach. They will respond positively to a self-instructional media package.

Language

Specialized instructional-design and game-design terminology is not a part of the trainees' vocabularies. They can, however, handle fairly sophisticated terminology about handicapped children and special education. Trainee preference is for a conversational, rather than a "textbookish," style.

Tool Skills

Trainees do not have any major handicapping conditions. They will be able to handle media equipment with some instructions.

APPENDIX R

Specification of Instructional Requirements
for an Audiovisual Training Module
on Instructional Games for Handicapped Children

Content Requirements

1. Discuss the use, modification, and adaptation of instructional games for handicapped children.
2. Provide a rationale for the use of instructional games with handicapped children.

Style and Format Requirements

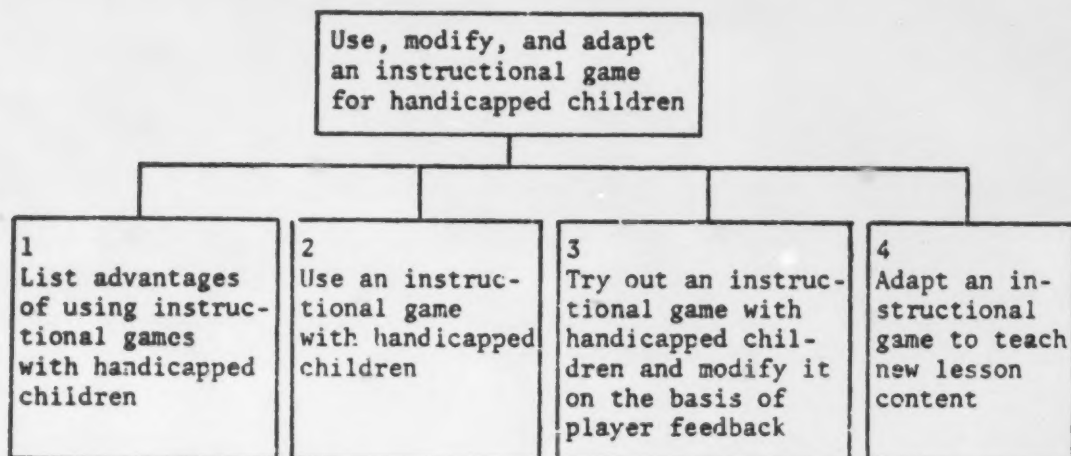
1. Assume minimal competencies on the part of the trainee related to the use, modification, and adaptation of instructional games.
2. Use a conversational but professional language with a minimum of technical terminology.
3. Incorporate meaningful examples from popular commercial games.
4. Provide ample opportunity for actual construction, use, modification, and adaptation of instructional games.

Utilization Procedure

1. The module should be self-contained, without the need for an instructor.
2. The module should permit flexible use with individuals, small groups and large groups.
3. The module should be portable to permit easy delivery to different places.
4. The module should be compatible with different commercial filmstrip projectors and audiocassette recorders.
5. The cost of the module should not exceed \$50.
6. The actual viewing time for the module should not exceed 30 minutes.

APPENDIX S

Task Analysis for the Audiovisual Training Module
on Instructional Games for Handicapped Children



APPENDIX T

Specific Objectives for the Audiovisual Training Moduleon Instructional Games for Handicapped Children

1. Explain the advantages of using instructional games with handicapped children.
2. Given sufficient directions, prepare play materials for an instructional game and use it with handicapped children.
3. Try out a given instructional game with handicapped children and modify it to make it more suitable for the children.
4. Adapt a given instructional game to teach a new instructional topic.

APPENDIX U

Criterion-Referenced Test on Parent Tutoring

1. You would like to have Mrs. Rodriguez tutor her son. Mrs. Rodriguez does not have a phone, so you are writing her a letter to establish initial contact. Write this letter in the space below:

2. Today you phoned Mrs. Barlson and asked her to come in and discuss her helping Denis, one of your handicapped pupils. We know what Mrs. Barlson said. What did you say? Respond by filling in the blanks in the following conversation between you and Mrs. Barlson.

Mrs. Barlson: Has Denis done anything wrong?"

You:

Mrs. Barlson: I'm glad you called. Denis tells me they painted the walls of his classroom. That's nice. I think pink is a good color. You know, my husband promised to paint our house last summer but he never got around to doing that

You:

Mrs. Barlson: What exactly do you want me to do?

You:

Mrs. Barlson: Well, when would you like me to come?

You:

Mrs. Barlson: Well, that sounds okay.

You:

Mrs. Barlson: 'Bye! I'll be there with Dennis' father.

3. You just finished talking to Mrs. Barlson and you want to prepare for the conference. Jot down an outline for what you want to cover during the conference.
4. Your telephone conversation with Mrs. Barlson paid off. She and her husband turned up at the school. But you can sense that they are rather hesitant about tutoring Denis. In your attempt to persuade them, what advantages of parent tutoring would you stress during the conversation?
5. The Barlsons, the Rodriguezes, and the Schwartzes have all agreed to become parent tutors. You have scheduled a couple of training sessions for them. What do you want to accomplish during these sessions? Write these down as objectives.
6. Prepare an outline for your training sessions for parents.
7. You are also preparing a little handout with practical tips for parent tutors. What are the items which will go into this handout?

8. Brenda Schwartz is a nine-year-old who finds numbers fun, but can't keep them in proper sequence after the number four. What would be a reasonable tutoring objective for the next five days?
9. Where would you go to find suitable materials which Mr. Schwartz can use in tutoring Brenda?
10. Your parent-tutoring program is off to a great start. What are you going to do to keep it up?

APPENDIX V

Criterion-Referenced Test on Instructional Games

1. Your friend, Joyce Goodwin, who teaches the other special education class, is skeptical about instructional games. You are trying to convince her that games are useful, especially with handicapped children. What are some of the advantages you would stress in your attempt to persuade Joyce?

2. You have decided to give Joyce an instructional game to try out in her classroom. What suggestions can you give her which will help her discover if it will work well with her pupils?

3. You gave Joyce a game called SET THE TABLE to try out in her class. You have a copy of this game printed on the last page of this handout. Joyce came back the next day with the following complaints. What modifications would you suggest to make it more suitable for her children?

Joyce's complaints	Your suggestions for modification
1. The children had difficulty with the small pictures on the playing cards. 2. There was confusion about when to lay down the three cards and pick up a plastic utensil. 3. It took a long time to collect all eight items of tableware.	

Joyce's complaints	Your suggestions for modification
4. When a player was making his play, the others were bored. 5. Only the smarter kids kept winning.	

4. Joyce has learned how to use this game and she is ready for the next one. Rather than give her a brand new game, you want to adapt the format of SET THE TABLE to teach some new content. Choose any instructional topic you like and an appropriate adaptation. Describe the adapted game in the space below:

Objective:

Equipment/Materials:

Number of Players:

Play (Game Rules):

Instructions for the Game:"SET THE TABLE"Objective

Student shall read names of various items of tableware.

Number of Players

Two to four.

Equipment

1. Plastic toy tableware: four each--spoon, fork, knife, glass, cup, plate, saucer, and napkin.
2. Picture cards: Two each of the eight tableware items.
3. Picture/word cards: Same as above with the word (e.g., spoon) printed below the picture.
4. Sentence cards: Same as the picture cards with an appropriate sentence (e.g., "The cup is white.") printed below the picture.

Play

1. The object of the game is to get three different cards involving the same object. The three cards may be any combination of picture, picture/word, or sentence cards.
2. The plastic tableware is placed in the middle of the table. One player shuffles the cards and deals seven cards to each player including himself. The remaining cards are placed in a pile face down in the center of the table with the top card placed face up beside it.
3. The first player begins by either drawing the top card from the pile or taking a face-up card. He then discards a card on the face-up pile. Play continues in this fashion with each player taking his turn.
4. When a player has three different cards involving the same object, he shows it to the other players. He picks the corresponding plastic tableware to indicate his achievement. He discards the set and draws three replacement cards from the face-down pile.
5. Game ends when any player collects all eight items of tableware.

APPENDIX W

Entry Questionnaire

Name: _____

School: _____ City/State/Zip: _____
(of school)

Age: _____ Sex: _____

Married _____ Single: _____ (Check one)

No. of children: _____

.....

How many years of experience do you have teaching handicapped learners?

_____ None

_____ Less than 1 year

_____ 1-2 years

_____ 3-5 years

_____ 6-10 years

_____ more than 10 years

What is your educational level?

_____ Freshman

_____ Sophomore

_____ Junior

_____ Senior

_____ Graduate student (Master's)

_____ Master's degree

_____ Doctor's degree

What is your major? _____

How many special education courses have you taken?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ 6-10
- ☐ 11-15
- ☐ 16-20

To which of the following categories do you belong?

- ☐ student
- ☐ student-teaching
- ☐ classroom teacher
- ☐ resource teacher
- ☐ consulting teacher
- ☐ supervising teacher
- ☐ school administrator
- ☐ other (specify)

If you teach, what age level(s) are your pupils?

- ☐ under 5
- ☐ 5
- ☐ 6-8
- ☐ 9-11
- ☐ 12-14
- ☐ above 15

What type of class(es) do you teach?

- ☐ regular
- ☐ special education
- ☐ regular with handicapped learners

Which adjectives apply to the school in which you are working?

- ☐ rich
- ☐ poor
- ☐ middle income
- ☐ rural
- ☐ urban
- ☐ suburban
- ☐ inner-city
- ☐ ghetto

APPENDIX X

Attitude Scale on Parent Tutoring

Given below are 20 statements about the use of parents as tutors. Read each statement carefully and indicate your reaction by circling one of the following coded responses:

SA = strongly agree
 A = agree
 U = undecided
 D = disagree
 SD = strongly disagree

- | | | | | | |
|--|----|---|---|---|----|
| 1. Teaching a child is too complicated for a parent. | SA | A | U | D | SD |
| 2. Parents are useless as tutors. | SA | A | U | D | SD |
| 3. Children are happy when their parents tutor them. | SA | A | U | D | SD |
| 4. Parent tutors can teach only trivial things. | SA | A | U | D | SD |
| 5. Parent tutors make their children uptight. | SA | A | U | D | SD |
| 6. Children learn more from parent tutors than from anyone else. | SA | A | U | D | SD |
| 7. To children, learning from their parent tutors is fun. | SA | A | U | D | SD |
| 8. Teachers should use more parent tutors. | SA | A | U | D | SD |
| 9. Children would much rather learn from teachers than from parent tutors. | SA | A | U | D | SD |
| 10. Parent tutors drive children up the wall. | SA | A | U | D | SD |
| 11. A parent is the best tutor a child can have. | SA | A | U | D | SD |
| 12. Parent tutors are beautiful. | SA | A | U | D | SD |
| 13. Using parent tutors is a waste of time. | SA | A | U | D | SD |
| 14. Using parent tutors is too complicated. | SA | A | U | D | SD |

- | | | | | | |
|---|----|---|---|---|----|
| 15. Parent tutors upset their children. | SA | A | U | D | SD |
| 16. It is a waste of resources to train parent tutors. | SA | A | U | D | SD |
| 17. Parent tutors are valuable teaching partners. | SA | A | U | D | SD |
| 18. Parent tutors are a hassle for the teacher. | SA | A | U | D | SD |
| 19. Children pick up a lot from parent tutoring sessions. | SA | A | U | D | SD |
| 20. There should be more parent tutors. | SA | A | U | D | SD |

APPENDIX Y

Attitude Scale on Instructional Games

Given below are 20 statements about the use of instructional games. Read each statement carefully and indicate your reaction by circling one of the following coded responses:

SA = strongly agree
 A = agree
 U = undecided
 D = disagree
 SD = strongly disagree

- | | | | | | |
|---|----|---|---|---|----|
| 1. Learning is too serious for games. | SA | A | U | D | SD |
| 2. Instructional games are worthless. | SA | A | U | D | SD |
| 3. Children are happy when they play instructional games. | SA | A | U | D | SD |
| 4. Instructional games teach only trivial things. | SA | A | U | D | SD |
| 5. Instructional games make children uptight. | SA | A | U | D | SD |
| 6. Children learn more from instructional games than from any other instructional activity. | SA | A | U | D | SD |
| 7. To children, instructional games are fun. | SA | A | U | D | SD |
| 8. Teachers should use more instructional games. | SA | A | U | D | SD |
| 9. Children would much rather learn from books than from instructional games. | SA | A | U | D | SD |
| 10. Instructional games drive children up the wall. | SA | A | U | D | SD |
| 11. Instructional games help children learn. | SA | A | U | D | SD |
| 12. Instructional games are beautiful. | SA | A | U | D | SD |
| 13. Playing games in the classroom is a waste of time. | SA | A | U | D | SD |

- | | | | | | |
|---|----|---|---|---|----|
| 14. Instructional games are too complicated. | SA | A | U | D | SD |
| 15. Instructional games upset children. | SA | A | U | D | SD |
| 16. It's a waste to spend money on instructional games. | SA | A | U | D | SD |
| 17. Instructional games are valuable teaching tools. | SA | A | U | D | SD |
| 18. Instructional games are a hassle for the teacher. | SA | A | U | D | SD |
| 19. Children pick up a lot from an instructional game. | SA | A | U | D | SD |
| 20. Classrooms should be filled with instructional games. | SA | A | U | D | SD |

APPENDIX Z

Semantic Differential on Self-Instruction

Given below are some pairs of adjectives which may be applied to self-instructional materials. Between each pair there are five blanks. Place an "X" in the blank which is closest to the way you feel about self-instructional materials.

unpleasant	_____	_____	_____	_____	_____	pleasant
useful	_____	_____	_____	_____	_____	useless
dull	_____	_____	_____	_____	_____	stimulating
powerful	_____	_____	_____	_____	_____	weak
effective	_____	_____	_____	_____	_____	ineffective
clear	_____	_____	_____	_____	_____	unclear
relevant	_____	_____	_____	_____	_____	irrelevant
practical	_____	_____	_____	_____	_____	idealistic
personally helpful	_____	_____	_____	_____	_____	not personally helpful
appropriate	_____	_____	_____	_____	_____	inappropriate
beneficial	_____	_____	_____	_____	_____	not beneficial
novel	_____	_____	_____	_____	_____	traditional
important	_____	_____	_____	_____	_____	unimportant
interesting	_____	_____	_____	_____	_____	boring
efficient	_____	_____	_____	_____	_____	inefficient
costly	_____	_____	_____	_____	_____	inexpensive
valuable	_____	_____	_____	_____	_____	valueless